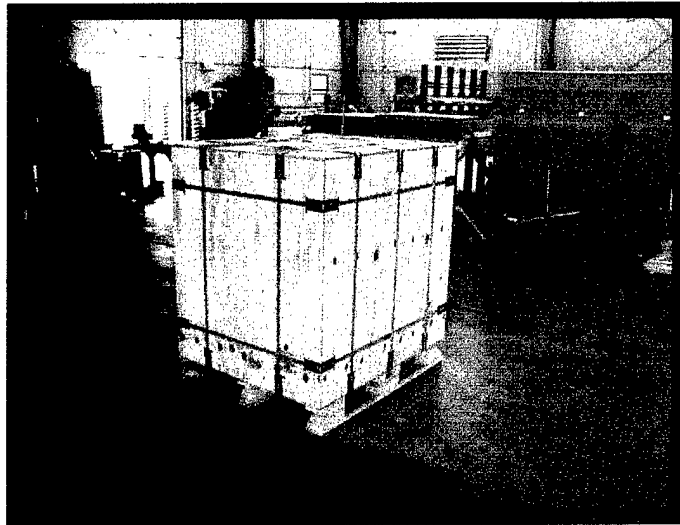


**FINAL REPORT  
JULY 2003**

**REPORT NO. 03-14**



**CLIP CRATE CONTAINER,  
MIL-STD-1660 FIRST ARTICLE TEST (FAT)**

Prepared for:

Distribution Unlimited

U.S. Army Defense Ammunition Center  
ATTN: SJMAC-DE  
1 C Tree Road, Bldg 35  
McAlester, OK 74501-9053



**VALIDATION ENGINEERING DIVISION  
MCALESTER, OKLAHOMA 74501-9053**

**20030915 100**

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**REPORT NO. 03-14  
CLIP CRATE CONTAINER,  
MIL-STD-1660 FIRST ARTICLE TEST (FAT)**

**July 2003**

**ABSTRACT**

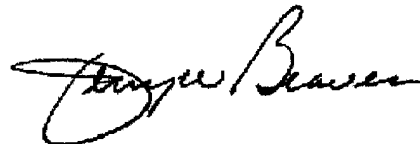
The U.S. Army Defense Ammunition Center (DAC), Validation Engineering Division (SJMAC-DEV) conducted First Article Test (FAT) per MIL-STD-1660, "Design Criteria for Ammunition Unit Loads" on the Clip Crate Container manufactured by Transport Packaging International Inc., from Atlanta, Georgia. The testing was accomplished to support the Mobile Ammunition Renovation, Inspection, and Demilitarization (MARID) Team of the Joint Munitions Command (JMC) proposed use of the clip crate container for unitization and truckload shipment of fiberboard boxes of explosives (Comp B) from Ravenna AP, OH to McAlester AAP, OK and the subsequent storage of bulk explosives. The testing was conducted on two containers with a load of 2,575 lbs. and two containers with a load of 4,115 lbs. The tests accomplished on the test units were the stacking, repetitive shock, edgewise rotational drop, incline-impact, forklifting, and disassembly tests. The containers passed all requirements with no significant problems encountered. As a result of the performance of the container, the Clip Crate Container manufactured by Transport Packaging International Inc. is recommended for United States Army-wide use world-wide.

Prepared by:



**JEFFERY L. DUGAN**  
Validation Engineer

Reviewed by:



**JERRY W. BEAVER**  
Chief, Validation Engineering Division

**U.S. ARMY DEFENSE AMMUNITION CENTER**

**VALIDATION ENGINEERING DIVISION  
MCALESTER, OK 74501-9053**

**REPORT NO. 03-14**

**CLIP CRATE CONTAINER,  
MIL-STD-1660 FIRST ARTICLE TEST (FAT)**

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## **PART 1 – INTRODUCTION**

**A. BACKGROUND.** The U.S. Army Defense Ammunition Center (DAC), Validation Engineering Division (SJMAC-DEV) conducted First Article Tests (FAT) per MIL-STD-1660, "Design Criteria for Ammunition Unit Loads" on the Clip Crate Container manufactured by Transport Packaging International Inc., from Atlanta, Georgia. The testing was accomplished to support the Mobile Ammunition Renovation, Inspection, and Demilitarization (MARID) Team of the Joint Munitions Command (JMC) proposed use of the clip crate container for unitization and truckload shipment of fiberboard boxes of explosives (Comp B) from Ravenna AP, OH to McAlester AAP, OK and the subsequent storage of bulk explosives. The testing was conducted on two containers with a load of 2,575 lbs. and two containers with a load of 4,115 lbs. The tests accomplished on the test units were the stacking, repetitive shock, edgewise rotational drop, incline-impact, forklifting, and disassembly tests. The unitization procedures were provided by DAC, Transportation Engineering Division (SJMAC-DET).

**B. AUTHORITY.** This test was conducted IAW mission responsibilities delegated by the U.S. Army Joint Munitions Command, Rock Island, IL. Reference is made to the following:

1. Change 6, AR 740-1, 18 August 1976, Storage and Supply Activity Operation.
2. OSC-R, 10-23, Mission and Major Functions of the U.S. Army Defense Ammunition Center (DAC) 21 Nov 2000.

**C. OBJECTIVE.** The objective of the tests was to determine if the Clip Crate Container met MIL-STD-1660 test requirements prior to the acceptance of the unitization procedures by the U.S. Army.

**D. CONCLUSION.** The containers passed all requirements with no significant problems encountered. As a result of the performance of the container, the Clip Crate Container manufactured by Transport Packaging International Inc. is recommended for United States Army-wide use worldwide.

## **PART 2 - ATTENDEES**

DATE PERFORMED:

Test Unit #1- 3 June 2003

Test Unit #2- 3-4 June 2003

Test Unit #3- 4 June 2003

Test Unit #4- 4-5 June 2003

### **ATTENDEES**

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Gregory L. Willis  
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Director  
US Army Defense Ammunition Center  
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Transport Packaging International Inc.  
2451 Cumberland Parkway, Suite 3317  
Atlanta, Georgia 30339

Transport Packaging International Inc.  
2451 Cumberland Parkway, Suite 3317,  
Atlanta, Georgia 30339

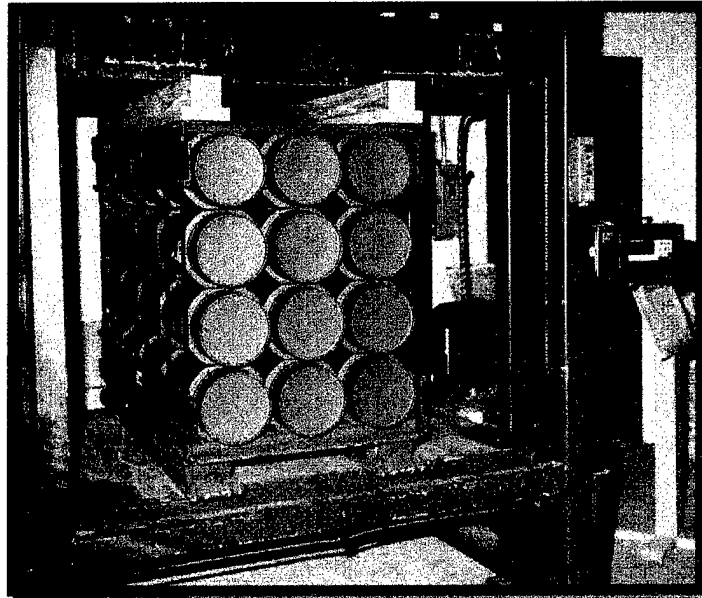
Director  
Defense Ammunition Center  
ATTN: SJMAC-DEV  
1 C-Tree Road, Bldg. 35  
McAlester, Oklahoma 74501

### **PART 3 - TEST PROCEDURES**

The test procedures outlined in this section were extracted from the MIL-STD-1660. The tests are conducted on ammunition pallet units or unit loads and are summarized as follows:

#### **A. MIL-STD-1660:**

1. **STACKING TEST**. The specimen will be tested to simulate a stack of identical items stacked 16 feet high, for a period of one hour. This stacking load will be simulated by subjecting the specimen to a compression weight equal to an equivalent 16-foot stacking height. Photo 1 below shows an example of a unit load in the compression tester.

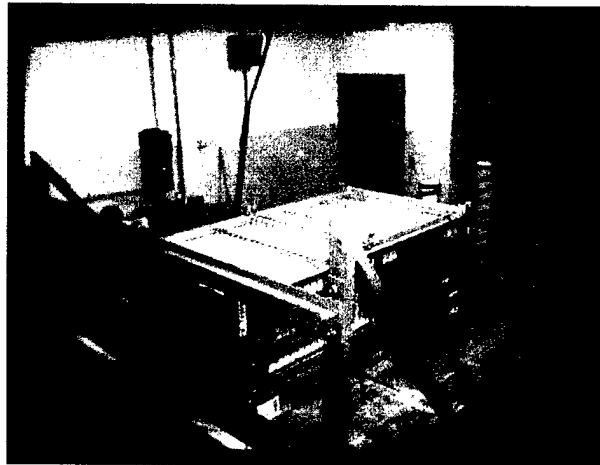


**Photo 1.** Example of Stacking Test.

**(2.75-inch Hydra 70, PA151 Rocket Pallet in the Stacking Tester.)**



**2. REPETITIVE SHOCK TEST.** The repetitive shock test is conducted IAW Method 5019, Federal Standard 101. The test procedure is as follows: The test specimen will be placed on (not fastened to) the platform. With the specimen in one position, the platform will be vibrated at ½-inch amplitude (1-inch double amplitude) starting at a frequency of approximately 3 cycles-per-second. The frequency will be steadily increased until the specimen leaves the platform. The resonant frequency is achieved when a 1/16-inch-thick feeler gage momentarily slides freely between every point on the specimen in contact with the platform at some instance during the cycle. Midway into the testing period, the specimen will be rotated 90 degrees, and the test continued for the duration. Unless failure occurs, the total time of vibration will be three hours. Photo 2 shows an example of the repetitive shock test.



**Photo 2. Example of the Repetitive Shock Test.  
(MSTF Low)**

**3. EDGEWISE ROTATIONAL DROP TEST.** This test is conducted using the procedures of Method 5008, Federal Standard 101. The procedure for the edgewise rotational drop test is as follows: The specimen will be placed on its skids with one end of the pallet supported on a beam 6 inches high. The height of the beam will be increased as necessary to ensure that there is no support for

the skids between the ends of the specimen when the dropping takes place, but should not be high enough to cause the specimen to slide on the supports when the dropped end is raised for the drop. The unsupported end of the specimen is then raised and allowed to fall freely to the concrete, pavement, or similar unyielding surface from a prescribed height. Unless otherwise specified, the height of drop for level A protection will conform to the following tabulation:

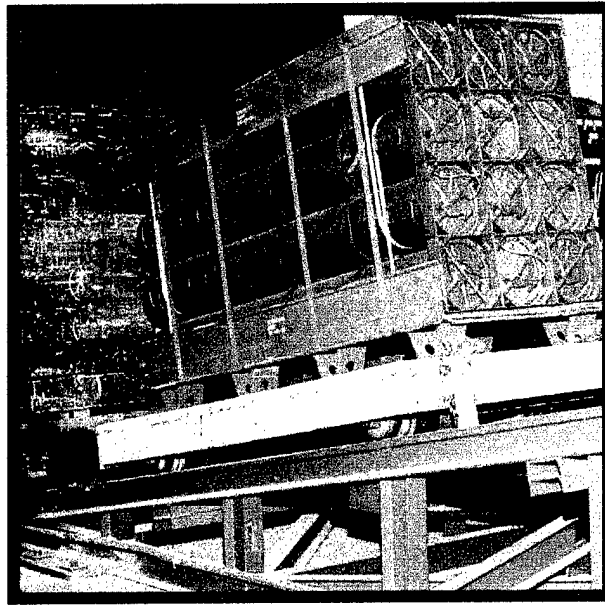
<b>GROSS WEIGHT (WITHIN RANGE LIMITS) (Pounds)</b>	<b>DIMENSIONS OF ANY EDGE, HEIGHT OR WIDTH (WITHIN RANGE LIMITS) (Inches)</b>	<b>HEIGHT OF DROPS ON EDGES</b>	
		<b>Level A (Inches)</b>	<b>Level B (Inches)</b>
<b>150-250</b>	<b>60-66</b>	<b>36</b>	<b>27</b>
<b>250-400</b>	<b>66-72</b>	<b>32</b>	<b>24</b>
<b>400-600</b>	<b>72-80</b>	<b>28</b>	<b>21</b>
<b>600-1,000</b>	<b>80-95</b>	<b>24</b>	<b>18</b>
<b>1,000-1,500</b>	<b>95-114</b>	<b>20</b>	<b>16</b>
<b>1,500-2,000</b>	<b>114-144</b>	<b>17</b>	<b>14</b>
<b>2,000-3,000</b>	<b>Above 145- No limited</b>	<b>15</b>	<b>12</b>
<b>Above – 3,000</b>		<b>12</b>	<b>9</b>

**Figure 1.**



**Photo 3. Example of Edgewise Rotational Drop Test  
(MSTF Low)**

**4. INCLINE-IMPACT TEST.** This test is conducted by using the procedure of Method 5023, Incline-Impact Test of Federal Standard 101. The procedure for the incline-impact test is as follows: The specimen will be placed on the carriage with the surface or edge to be impacted projecting at least 2 inches beyond the front end of the carriage. The carriage will be brought to a predetermined position on the incline and released. If it were desired to concentrate the impact on any particular position on the container, a 4- x 4-inch timber may be attached to the bumper in the desired position before the test. The carriage will not strike any part of the timber. The position of the specimen on the carriage and the sequence in which surfaces and edges are subjected to impacts may be at the option of the testing activity and dependent upon the objective of the test. When the test is to determine satisfactory requirements for a container or pack, and, unless otherwise specified, the specimen will be subjected to one impact on each surface that has each dimension less than 9.5 feet. Unless otherwise specified, the velocity at the time of the impact will be 7 feet-per-second. Photo 4 shows an example of this test.



**Photo 4. Example of the Incline-Impact Test.  
(2.75-Inch, Hydra 70, PA151 Rocket Pallet on incline-impact tester.)**

**5. SLING COMPATIBILITY TEST.** The specimen utilizing special design or non-standard pallets will be lifted, swung, lowered and otherwise handled as necessary, using slings of the types normally used for handling the unit loads under consideration. Slings will be easily attached and removed. Danger of slippage or disengagement when load is suspended will be cause for rejection of the specimen.

**6. FORKLIFTING TESTS.** The specimen will be lifted clear of the ground by a forklift from the end of the specimen and transported on the forks in the level or back-tilt position. The forklift will pass over the Optional Rough Handling Course For Forklift Trucks as outlined in MIL-STD-1660. The course will consist of parallel pairs of 1-inch boards spaced 54 inches apart and will be laid flat wise on the pavement across the path of the forklift. One pair will be laid at an angle of approximately 60 degrees to the path so that the left wheel strikes first. Another pair will be laid securely across the path of the forklift so that the wheels strike simultaneously. Another pair will be laid at an angle of approximately 75 degrees to the path so that the right wheel strikes first. The specimen will be transported

down and back the Optional Rough Handling Course one time. The forklift will be brought to a stop prior to traversing the course. The specimen shall be observed for deflection and damage. The specimen will be rotated 90 degrees and the specimen lifted from the side and the above steps repeated.

**7. DISASSEMBLY TEST.** Following all rough handling tests the specimen may be squared up within 2 inches of its original shape and on a flat level surface. The strapping will then be cut and removed from the palletized load. Assembly of the specimen will be such that it retains its unity upon removal of the strapping.

## **PART 4 - TEST EQUIPMENT**

### **A. COMPRESSION TESTER.**

1. Nomenclature	Compression Table
2. Manufacturer:	Ormond Manufacturing
3. Platform:	60- by 60-inches
4. Compression Limit:	50,000 pounds
5. Tension Limit:	50,000 pounds

### **B. TRANSPORTATION (REPETITIVE SHOCK)SIMULATOR.**

1. Nomenclature	Repetitive Shock Simulator
2. Manufacturer:	Gaynes Laboratory
3. Capacity:	6,000-pound payload
4. Displacement:	1/2-inch amplitude
5. Speed:	50 to 400 RPM
5. Platform:	5- by 8-foot

### **C. INCLINED PLANE.**

1. Nomenclature	Incline Plane Impact Tester
2. Manufacturer:	Conbur Incline
3. Type:	Impact Tester
4. Grade:	10 percent incline
5. Length:	12-foot

## **PART 5 - TEST RESULTS**

**A. CONTAINER DATA.** The test units were inertly loaded to the specified design weight. The test specimen was prepared using the unitization procedures specified in Part 6 – Drawings. Special care was taken to ensure that each individual interior ammunition container had the proper amount of weight in order to achieve a realistic pallet center of gravity (CG). Once properly prepared, the test unit was tested using MIL-STD-1660, "Design Criteria for Ammunition Unit Loads," requirements.

### **TEST UNIT #1:**

Weight: 4,115 pounds  
Length: 48 inches  
Width: 40 inches  
Height: 51-1/2 inches

### **Container Inertly loaded with:**

30 Each M548 Containers at 126 lbs  
with ¾" plywood bottom support piece  
and 7 sheets of tri-wall fiberboard  
placed between containers to fill voids  
(See Photo 5)

### **TEST UNIT #2:**

Test Dates: 3-4 June 2003  
Weight: 2,575 pounds  
Length: 48 inches  
Width: 40 inches  
Height: 51-1/2 inches

### **Container Inertly loaded with:**

36 each fiberboard boxes at 64 lbs  
with 2 sheets of tri-wall fiberboard  
to fill voids  
(See Photo 6)

### **TEST UNIT #3:**

Test Date: 4 June 2003  
Weight: 4,115 pounds  
Length: 48 inches  
Width: 40 inches  
Height: 51-1/2 inches

### **Container Inertly loaded with:**

30 Each M548 Containers at 126 lbs  
with ¾" plywood bottom support piece  
and 7 sheets of tri-wall fiberboard  
placed between containers to fill voids

**TEST UNIT #4:**

Test Dates: 4-5 June 2003

Container Inertly loaded with:

Weight: 2,575 pounds

36 each fiberboard boxes at 64 lbs

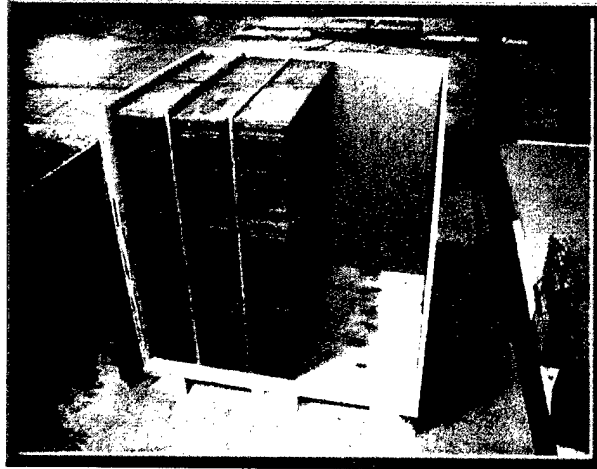
Length: 48 inches

with 2 sheets of tri-wall fiberboard

Width: 40 inches

to fill voids

Height: 51-1/2 inches



**Photo 5. Test Unit #1 during loading of M548 Containers.**

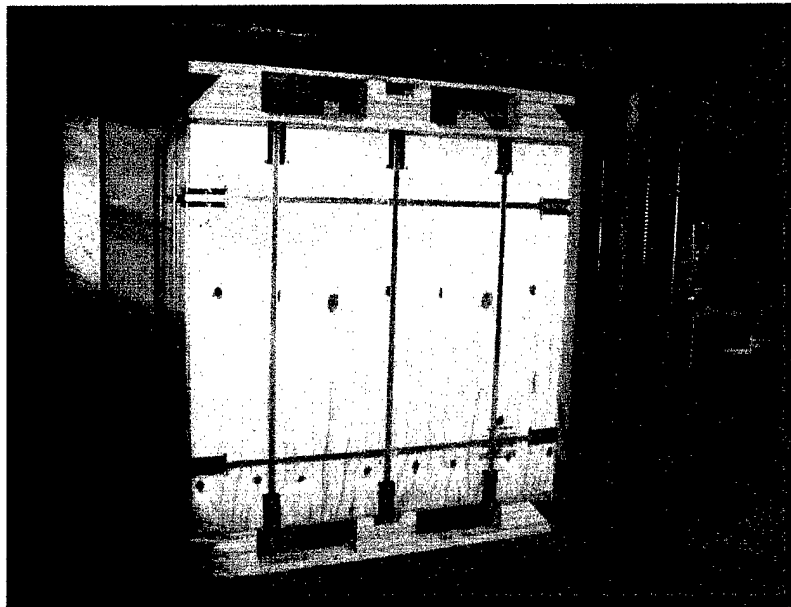


**Photo 6. Test Unit #3 during loading of fiberboard boxes.**



## **B. TEST RESULTS - TEST UNIT #1:**

1. **STACKING TEST.** Test Unit #1 was compressed with a load force of 12,345 pounds for 60 minutes on 4 June 2003. There was no damage noted to the test unit as a result of this test. See Photo 7 below for a typical picture of the test unit in the compression tester.



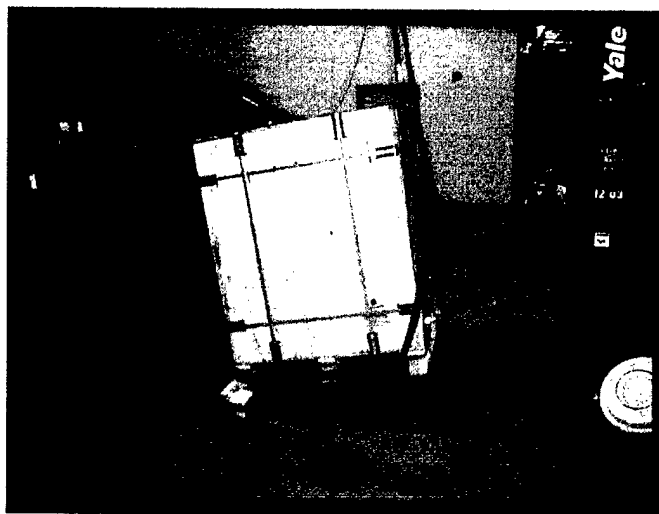
**Photo 7. Test Setup for Compression Testing.**

2. **REPETITIVE SHOCK TEST.** Test Unit #1 was vibrated 90 minutes at 221 RPM in the longitudinal orientation and 90 minutes at 259 RPM in the lateral orientation on 3 June 2003. There was minor abrasion damage to the bottom deck boards that occurred while sliding the test unit across the vibration table. See Photo 8 for the test setup for the vibration test.



**Photo 8. Test Setup for Repetitive Shock Tests.**

3. **EDGEWISE ROTATIONAL DROP TEST.** Test Unit #1 was edgewise rotationally dropped from a height of 12 inches on both longitudinal sides and both lateral sides. No damage was noted from this test. See Photo 9 for the test setup for the edgewise rotational drop tests.



**Photo 9. Test Setup for Edgewise Rotational Drop Testing.**

4. **INCLINE-IMPACT TEST.** Test Unit #1 was incline-impacted on all four sides with the pallet impacting the stationary wall from a distance of 8 feet. No

additional problems were encountered. See Photo 10 for test setup for incline-impact testing.



**Photo 10. Test Setup for Incline-Impact Testing.**

**5. FORKLIFTING TEST.** Test Unit #1 was lifted from the end of the pallet on the forks of the forklift truck and carried over the hazard course three times with no damage nor instability noted. The test unit was lifted from the opposite end of the pallet and the above steps accomplished with no problems encountered. See Photo 11 for the test setup during the forklifting test.



**Photo 11. Test Setup for Forklifting Testing.**

6. **DISASSEMBLY TEST**. During the disassembly of Test Unit #1 no additional problems were noted.

7. **CONCLUSION**. Test Unit #1 passed all required tests.

**C. TEST RESULTS - TEST UNIT #2:**

1. **STACKING TEST**. Test Unit #2 was compressed with a load force of 7,725 pounds for 60 minutes on 3 June 2003. No damage was noted as a result of this test.

2. **REPETITIVE SHOCK TEST**. Test Unit #2 was vibrated 90 minutes at 225 RPM in the longitudinal orientation and 259 RPM in the lateral orientation. No damage was noted as a result of this test.

3. **EDGEWISE ROTATIONAL DROP TEST.** Test Unit #2 was edgewise rotationally dropped from a height of 15 inches on both longitudinal sides and both lateral sides. No damage was noted from this test.

4. **INCLINE-IMPACT TEST.** Test Unit #2 was incline-impacted on all four sides with the pallet impacting the stationary wall from a distance of 8 feet. No additional problems were encountered.

5. **FORKLIFTING TEST.** Test Unit #2 was lifted from the end of the pallet on the forks of the forklift truck and carried over the hazard course three times with no damage nor instability noted. The test unit was lifted from the opposite end of the pallet and the above steps accomplished with no problems encountered.

6. **DISASSEMBLY TEST.** During the disassembly of Test Unit #2 no additional problems were noted.

7. **CONCLUSION.** Test Unit #2 passed all required tests.

**D. TEST RESULTS - TEST UNIT #3:**

1. **STACKING TEST.** Test Unit #3 was compressed with a load force of 12,345 pounds for 60 minutes on 4 June 2003. There was no damage noted to the test unit as a result of this test.

2. **REPETITIVE SHOCK TEST.** Test Unit #3 was vibrated 90 minutes at 166 RPM in the longitudinal orientation and 90 minutes at 259 RPM in the lateral orientation on 4 June 2003. It should be noted that the 166 RPM in the longitudinal orientation is considerably lower than the RPM required for the other three test units in the same orientation. The only noticeable difference in the test

units was that the banding in this direction for this test unit was noticeably tighter. There was no apparent damage sustained during this test.

3. **EDGEWISE ROTATIONAL DROP TEST**. Test Unit #3 was edgewise rotationally dropped from a height of 12 inches on both longitudinal sides and both lateral sides. No damage was noted from this test.

4. **INCLINE-IMPACT TEST**. Test Unit #3 was incline-impacted on all four sides with the pallet impacting the stationary wall from a distance of 8 feet. No additional problems were encountered.

5. **FORKLIFTING TEST**. Test Unit #3 was lifted from the end of the pallet on the forks of the forklift truck and carried over the hazard course three times with no damage nor instability noted. The test unit was lifted from the opposite end of the pallet and the above steps accomplished with no problems encountered.

6. **DISASSEMBLY TEST**. During the disassembly of Test Unit #3 no additional problems were noted.

7. **CONCLUSION**. Test Unit #3 passed all required tests.

**E. TEST RESULTS - TEST UNIT #4:**

1. **STACKING TEST**. Test Unit #4 was compressed with a load force of 7,725 pounds for 60 minutes on 4 June 2003. No damage was noted as a result of this test.

2. **REPETITIVE SHOCK TEST**. Test Unit #4 was vibrated 90 minutes at 225 RPM in the longitudinal orientation and 259 RPM in the lateral orientation. No damage was noted as a result of this test.

3. **EDGEWISE ROTATIONAL DROP TEST.** Test Unit #4 was edgewise rotationally dropped from a height of 15 inches on both longitudinal sides and both lateral sides. No damage was noted from this test.

4. **INCLINE-IMPACT TEST.** Test Unit #4 was incline-impacted on all four sides with the pallet impacting the stationary wall from a distance of 8 feet. No additional problems were encountered.

5. **FORKLIFTING TEST.** Test Unit #4 was lifted from the end of the pallet on the forks of the forklift truck and carried over the hazard course three times with no damage nor instability noted. The test unit was lifted from the opposite end of the pallet and the above steps accomplished with no problems encountered.

6. **DISASSEMBLY TEST.** During the disassembly of Test Unit #4 no additional problems were noted.

7. **CONCLUSION.** Test Unit #4 passed all required tests.

## **PART 6– DRAWINGS**

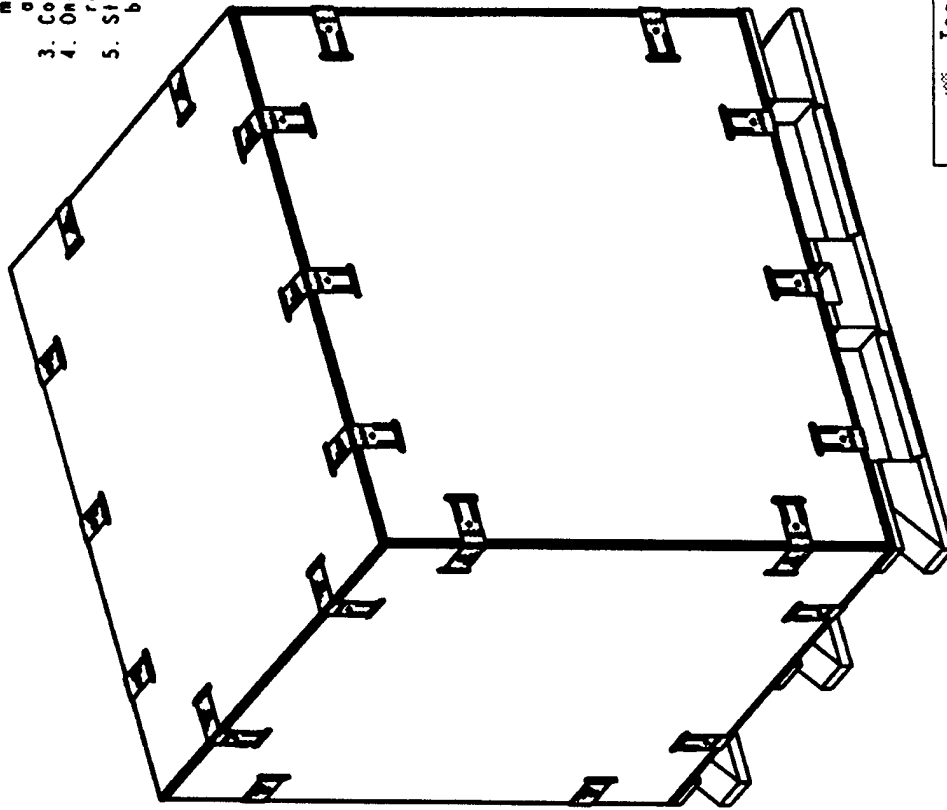
The following test sketches represent the load configuration that was subjected to the test criteria.



# CONTAINER MCAAP0304A REV3

## Design Notes:

1. All marine-grade plywood construction.
2. Blocks and runners are laminated marine-grade plywood and are nailed and bolted to the base panel.
3. Container is slingable.
4. One loose marine-grade plywood base reinforcement is included with the pack.
5. Strapping slots provided through center blocks.



Internal Dimensions, Inches: 46.5"L x 38.5"W x 44.9"H  
 (Excluding base reinforcement)  
 Internal Dimensions, mm: 1182 L x 978 W x 1141 H  
 (Excluding base reinforcement)  
 Internal Dimensions, Inches: 46.5"L x 38.5"W x 44.2"H  
 (Including base reinforcement)  
 Internal Dimensions, mm: 1182 L x 978 W x 1123 H  
 (Including base reinforcement)  
 External Dimensions, Inches: 48.0"L x 40.0"W x 51.5"H  
 External Dimensions, mm: 1218 L x 1014 W x 1310 H

Drawing in Electronic Database  
 Manual Changes Forbidden

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 DO NOT SCALE DRAWING

DECIMAL TOLERANCES:  
 X ± 0.5mm  
 X ± 0.25mm

ANGULAR TOLERANCES:  
 X ± 2 DEG  
 X ± 0.5 DEG

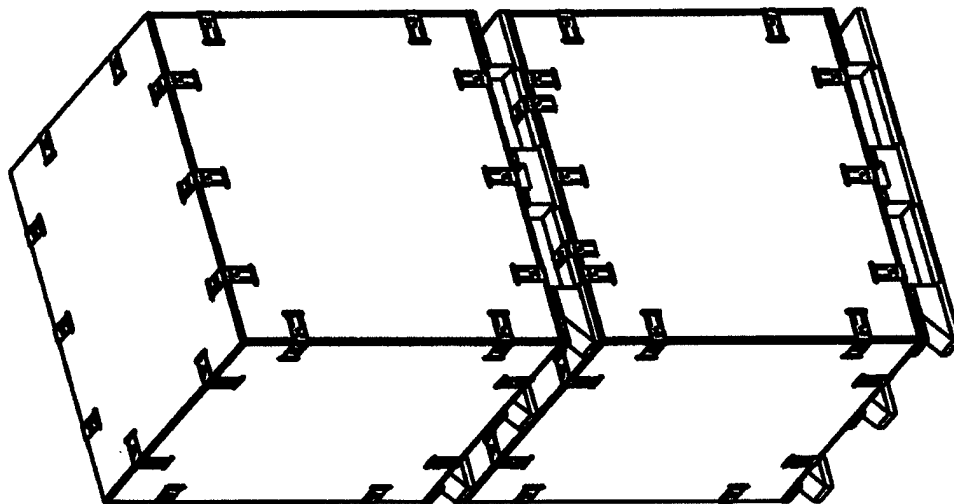


Transport Packaging International, Inc.  
 2451 Cumberland Parkway  
 Suite 3317  
 Atlanta, Georgia 30339 USA  
 TEL: +1 770-739-9691

Part Name: CONTAINER MCAAP0304A REV3 ASSEMBLY  
 DWG NO: MCAAP0304A-REV3-ASY-ALL REV: 3  
 Material: 18mm 9-Ply Plywood (exc. 25mm runners)  
 Creation Date: 05-14-2003  
 Sheet: 1 Of 17 Size: A Scale: None

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# CONTAINER MCAAP0304A REV3



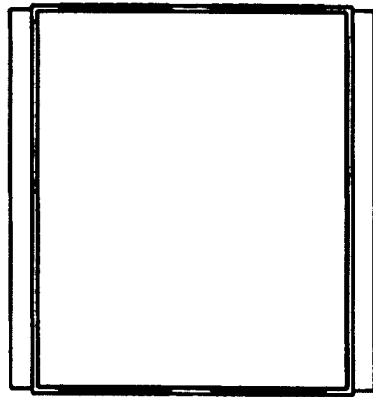
Transport Packaging International, Inc.  
2451 Cumberland Parkway  
Suite 3317  
Atlanta, Georgia 30339 USA  
TEL: +1 770-739-9691

Part Name: CNTR MCAAP0304A REV3 STACKING INFO  
DWG NO: MCAAP0304A-REV3-ASY-STACKED [REV: 3]  
Material: 18mm 9-Ply Plywood (exc. 2.5mm runners)  
Creation Date: 05-14-2003  
Sheet 2 OF 17 Size: A Scale: None  
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DECIMAL TOLERANCES:  
X ± 0.5mm  
X ± 0.25mm  
ANGULAR TOLERANCES:  
X ± 2 DEG  
X ± 0.5 DEG

Stacking Dimensions:  
External Dimensions, Inches: 48.0"L x 40.0"W x 103.0"H  
External Dimensions, mm: 1218 L x 1014 W x 2618 H

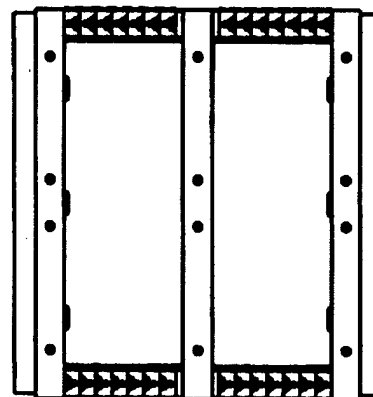
# CONTAINER MCAAP0304A REV3 FLATPACKING INSTRUCTIONS



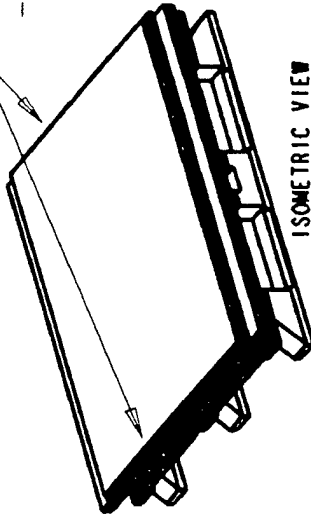
TOP VIEW



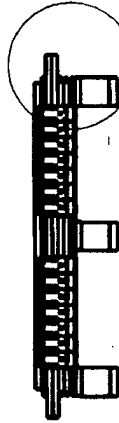
SIDE VIEW



BOTTOM VIEW



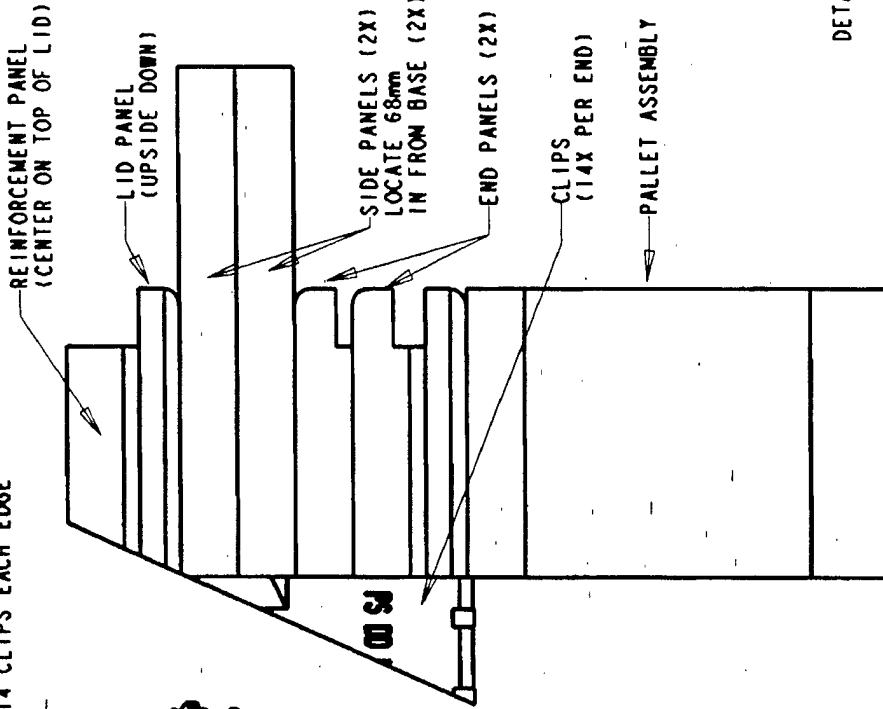
ISOMETRIC VIEW



END VIEW

SEE DETAIL STACK ORDER

14 CLIPS EACH EDGE



DETAIL  
SCA

Transport Packaging International, Inc.  
2451 Cumberland Parkway  
Suite 3317  
Atlanta, Georgia 30339 USA  
TEL: +1 770-739-9691

Drawing in Electronic Database Manual Changes Forbidden	Part Name: MCAAP0304A REV3 PACKING INSTRUCTIONS
UNLESS OTHERWISE SPECIFIED: DO NOT SCALE DRAWING	DWG NO: MCAAP0304A-REV3-ASY-FLATPACKED REV: 3
DECIMAL TOLERANCES: X ± 0.5mm X X ± 0.25mm	Material: 18mm 9-Ply Plywood (exc. 25mm runners)
ANGULAR TOLERANCES: X ± 2 DEG X X ± 0.5 DEG	Creation Date: 05-14-2003
	Sheet: 3 OF 17 Size: A Scale: None
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# UNITIZATION PROCEDURES FOR PALLET BOX PACKING OF RETROGRADE AMMUNITION

## WARNING:

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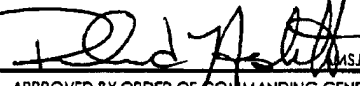

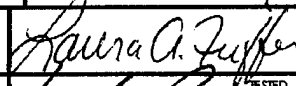
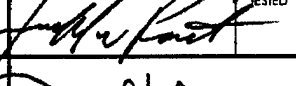
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## DISTRIBUTION STATEMENT A:

APPROVED FOR PUBLIC RELEASE;  
DISTRIBUTION IS UNLIMITED.

## U.S. ARMY MATERIEL COMMAND DRAWING

APPROVED, U.S. ARMY JOINT MUNITIONS COMMAND <i>NLH</i>  AMSTA-AR-WEP-RP		<b>CAUTION: VERIFY PRIOR TO USE AT WWW.DAC.ARMY.MIL/DET THAT THIS IS THE MOST CURRENT VERSION OF THIS DOCUMENT. THIS IS PAGE 1 OF 8.</b>					
APPROVED BY ORDER OF COMMANDING GENERAL, U.S. ARMY MATERIEL COMMAND  U.S. ARMY DEFENSE AMMUNITION CENTER		<b>DO NOT SCALE</b>		<b>MAY 1991</b>			
		ENGINEER OR TECHNICIAN	BASIC REV.	SANDRA M. SCHULTZ LAURA A. FIEFFER		REVISION NO. 4	MAY 2003
TRANSPORTATION ENGINEERING DIVISION  VALIDATION ENGINEERING DIVISION  ENGINEERING DIRECTORATE		  		SEE THE REVISION LISTING ON PAGE 4			
				CLASS	DIVISION	DRAWING	FILE
				19	48	4233	20PE1000

PROJECT CA 245-87

## GENERAL NOTES

- A. THIS DOCUMENT HAS BEEN PREPARED AND ISSUED IN ACCORDANCE WITH AR 740-1, AND AUGMENTS TM 743-200-1 (CHAPTER 5) AND CONFORMS TO MIL-STD-1660.
- B. THE FOLLOWING AMC DRAWINGS ARE APPLICABLE FOR OUTLOADING AND STORAGE OF THE ITEMS COVERED BY THIS APPENDIX.
- |                                      |                                |
|--------------------------------------|--------------------------------|
| CARLOADING - - - - -                 | 19-48-4115-5PA1002             |
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| STORAGE - - - - -                    | 19-48-4118-1-2-3-4-14-22PA1002 |
| END OPENING ISO CONTAINER - - - - -  | 19-48-4153-15PA1002            |
| MILVAN - - - - -                     | 19-48-4166-15PA1003            |
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- C. UNLESS OTHERWISE SPECIFIED, A MANUFACTURING TOLERANCE OF PLUS-OR-MINUS 1/4" IS ALLOWED ON ALL DIMENSIONS. HOWEVER, SIMILAR PIECES IN AN ASSEMBLY MUST BE WITHIN 1/8" OF THE SAME DIMENSION.
- D. DIMENSIONAL LUMBER SPECIFIED THROUGHOUT THE DRAWING IS OF NOMINAL SIZE. FOR EXAMPLE, 2" X 4" MATERIAL IS ACTUALLY 1-1/2" THICK BY 3-1/2" WIDE.
- E. INSTALL EACH HORIZONTAL, LOAD OR TIEDOWN STRAP TO BE LOCATED AS SHOWN. HORIZONTAL STRAPS MUST BE TENSIONED AND SEALED PRIOR TO THE APPLICATION OF TIEDOWN AND LOAD STRAPS. LOAD STRAPS MUST BE TENSIONED AND SEALED AFTER THE HORIZONTAL STRAPS AND PRIOR TO THE TIEDOWN STRAPS. THE LOAD STRAPS ON PALLET UNIT "A" MUST BE THREADED THROUGH THE STRAP SLOTS OF THE PALLET.
- F. WHEN APPLYING ANY STRAP, CARE MUST BE EXERCISED TO ASSURE THAT THE END OF THE STRAP ON THE UNDERSIDE OF THE JOINT EXTENDS AT LEAST 6" BEYOND THE SEAL. THIS EXTRA MINIMUM LENGTH OF STRAP IS REQUIRED TO PERMIT SUBSEQUENT TIGHTENING OF LOOSENED STRAPPING. RETENSIONING CAN BE ACCOMPLISHED WITHOUT REPLACING STRAPPING OR SPLICING STRAPPING THROUGH THE USE OF A MANUAL OR PNEUMATIC FEEDWHEEL TYPE TENSIONING TOOL AND THE APPLICATION OF ONE ADDITIONAL SEAL.
- G. IN ORDER TO OBTAIN COMPACT AND SOUND UNITS, ALL STRAPS SHALL BE LOCATED IN PROPER ALIGNMENT AND TENSIONED UNTIL THEY CUT INTO THE EDGE OF THE PALLET BOX AND THE PALLET DECK. AFTER TENSIONING, ALL STRAPS WILL BE SECURED USING ONE SEAL AND TWO PAIR OF NOTCHES PER SEAL.
- H. COOLER NAILS MAY BE SUBSTITUTED FOR THE COMMON NAILS AS SPECIFIED BY APPLYING THE FOLLOWING GUIDANCE. THE NUMBER OF COOLER NAILS TO BE USED WILL BE THE NUMBER OF COMMON NAILS MULTIPLIED BY 1.2 AND ROUNDED UP TO THE NEXT WHOLE NUMBER. THE SIZE OF THE COOLER NAILS TO BE USED WILL BE THE SAME AS SPECIFIED FOR THE COMMON NAILS (4d, 6d, 10d, ETC.) BUT WILL CONFORM TO THE SIZE AND WEIGHT TOLERANCES SPECIFIED WITHIN ASTM F1667 FOR COOLER NAILS.
- J. ALL NON-MANUFACTURED WOOD USED IN THE PALLETIZED LOAD SHALL BE HEAT TREATED TO A CORE TEMPERATURE OF 56 DEGREES CELSIUS FOR A MINIMUM OF 30 MINUTES. THE PALLET MANUFACTURER AND THE MANUFACTURER OF WOOD TO BUILD FILLER ASSEMBLIES AND DUNNAGE ASSEMBLIES FOR THE PALLETIZED LOAD SHALL BE AFFILIATED WITH AN INSPECTION AGENCY ACCREDITED BY THE AMERICAN LUMBER STANDARDS COMMITTEE. THE PALLET MANUFACTURER AND THE MANUFACTURER OF WOOD USED TO BUILD FILLER ASSEMBLIES AND DUNNAGE ASSEMBLIES FOR THE PALLETIZED LOAD SHALL ENSURE TRACEABILITY TO THE ORIGINAL SOURCE OF HEAT TREATMENT. EACH PALLET, FILLER ASSEMBLY, OR DUNNAGE ASSEMBLY SHALL BE MARKED TO SHOW THE CONFORMANCE TO THE INTERNATIONAL PLANT PROTECTION CONVENTION STANDARD. PALLETS, FILLER ASSEMBLIES AND DUNNAGE ASSEMBLIES MADE OF NON-MANUFACTURED WOOD SHALL BE HEAT TREATED AND MARKED APPROPRIATELY. THE QUALITY MARK FOR THE PALLET SHALL BE PLACED ON TWO OPPOSITE END POSTS ON THE SAME SIDE AS THE PRESERVATIVE MARKING. THE QUALITY MARK FOR THE FILLER ASSEMBLIES AND DUNNAGE ASSEMBLIES SHALL BE PLACED ON TWO OPPOSITE SIDES. FOREIGN MANUFACTURERS SHALL HAVE THE HEAT TREATMENT OF NON-MANUFACTURED WOOD PRODUCTS VERIFIED IN ACCORDANCE WITH THEIR NATIONAL PLANT PROTECTION ORGANIZATION'S COMPLIANCE PROGRAM. CLIP-LOK™ BOXES, AS DEPICTED ON PAGE 8, ARE CONSTRUCTED OF ALL PLYWOOD AND DO NOT REQUIRE HEAT TREATMENT.
- K. UNIT LOAD MARKING MUST BE APPLIED AND MUST BE REQUESTED FROM THE ORGANIZATION LISTED IN THE "WARNING" ON THE COVER PAGE.

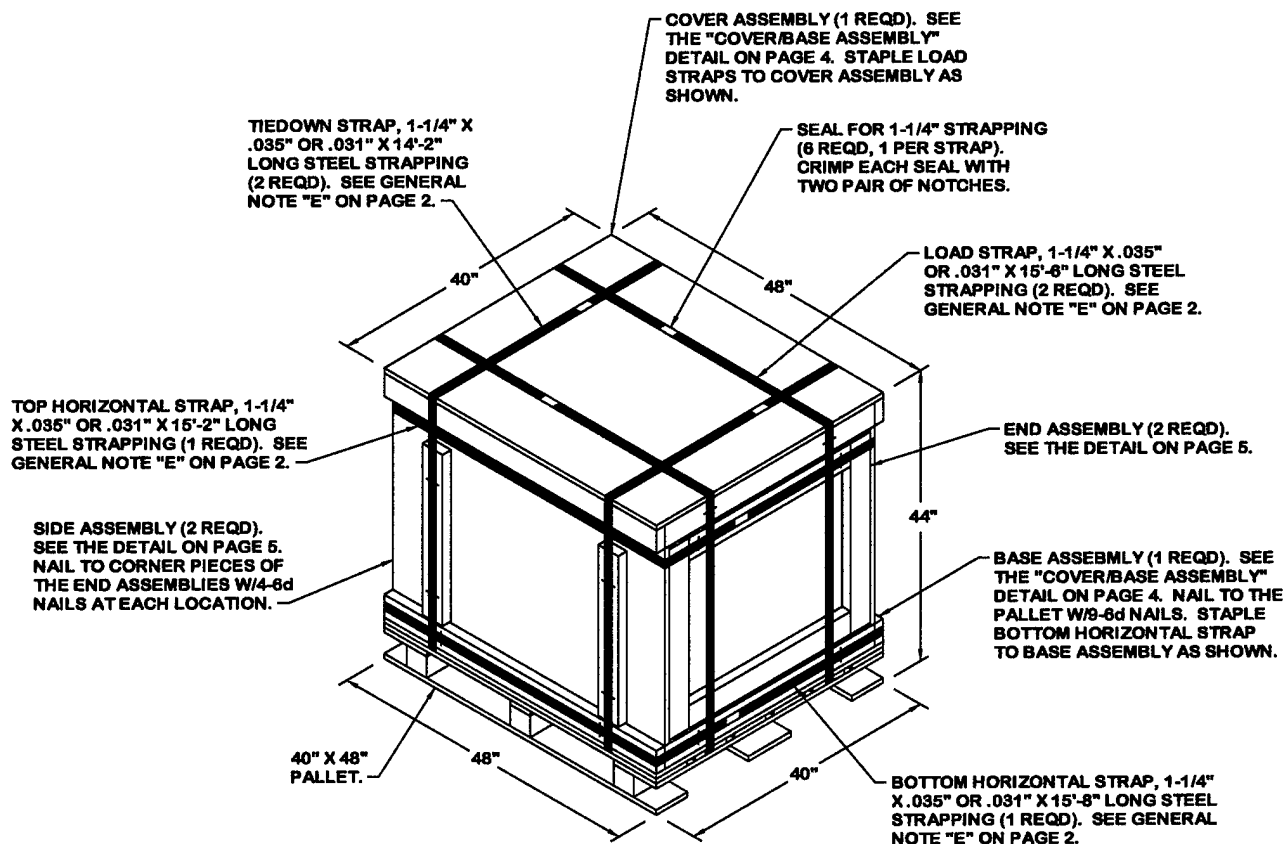
(CONTINUED AT RIGHT)

## (GENERAL NOTES CONTINUED)

- L. PACKAGED RETROGRADE AMMUNITION MUST CONTACT THE SIDE AND END ASSEMBLIES. FIBERBOARD LINERS SHALL BE USED FOR UNPACKAGED RETROGRADE AMMUNITION TO PREVENT CONTACT WITH THE SIDE AND END ASSEMBLIES. FILLERS SUCH AS PLYWOOD, FIBERBOARD, HONEYCOMB FILLER, FOAM CUSHIONING MATERIAL OR HARDBOARD SHALL BE ADDED AS REQUIRED TO OBTAIN A TIGHT PACK. FOR PROCEDURES FOR A SPECIFIC ITEM REFER TO THE APPLICABLE APPENDIX.
- M. PALLET UNIT "A" DETAILS ARE BASED ON THE MAXIMUM ALLOWABLE DIMENSIONS OF THE PALLET UNIT. THE HEIGHT OF THE SIDE AND END ASSEMBLIES MAY BE SHORTENED ACCORDING TO THE SIZE AND WEIGHT OF THE RETROGRADE AMMUNITION ITEMS INSIDE.
- N. REGARDLESS OF THE QUANTITY OF RETROGRADE AMMUNITION ITEMS TO BE PALLETIZED, THE TOTAL WEIGHT OF A FULLY LOADED PALLET UNIT WILL NOT EXCEED 3,000 POUNDS FOR PALLET UNIT "A" AND 4,000 POUNDS FOR PALLET UNIT "B". WHEN THE TOTAL WEIGHT OF A FULLY LOADED PALLET UNIT EXCEEDS THESE WEIGHTS, AMMUNITION ITEMS MUST BE REMOVED, AND FILLER MATERIAL, SUCH AS EMPTY BOXES, FIBERBOARD, HARDBOARD, HONEYCOMB FILLER, FOAM CUSHIONING MATERIAL, PLYWOOD, OR WOOD MUST BE SUBSTITUTED.
- O. THE STYLE 1 PALLET DELINEATED IN THE DETAIL ON PAGE 3 NEED NOT HAVE CHAMFERS AS SPECIFIED WITHIN MILITARY SPECIFICATION MIL-P-15011 WHEN USED FOR THE UNITIZATION OF ITEMS COVERED BY THIS APPENDIX.

## MATERIAL SPECIFICATIONS

PALLET - - - - -	MIL SPEC MIL-P-15011; 4-WAY ENTRY, STYLE 1, TYPE I, CLASS 1, HEAT TREATED. SEE GENERAL NOTE "J".
LUMBER - - - - -	SEE TM 743-200-1 (DUNNAGE LUMBER) AND VOLUNTARY PRODUCT STANDARD PS 20. HEAT TREATMENT REQUIRED. SEE GENERAL NOTE "J".
NAILS - - - - -	ASTM F1667; COMMON STEEL NAIL (NLCMS OR NLCHMS). ALT: UNDERLAYMENT NAIL (NLUL), PALLET NAIL (NLPL), OR COOLER NAIL (NLCL) OF SAME SIZE. SEE GENERAL NOTE "H".
PLYWOOD - - - - -	COMMERCIAL ITEM DESCRIPTION A-A-55057, INDUSTRIAL PLYWOOD, INTERIOR WITH EXTERIOR GLUE, GRADE C-D. IF SPECIFIED GRADE IS NOT AVAILABLE, A BETTER INTERIOR OR AN EXTERIOR GRADE MAY BE SUBSTITUTED.
STRAPPING, STEEL - - - - -	ASTM D3953; FLAT STRAPPING, TYPE 1, HEAVY DUTY, FINISH B (GRADE 2), SIZE 3/4" OR 1-1/4" X .035" OR .031". NOTE: BRITE OR SLIT EDGES SHALL HAVE FINISH A OVERLAY.
SEAL, STRAP - - - - -	ASTM D3953; CLASS H, FINISH B (GRADE 2), DOUBLE NOTCH TYPE, STYLE I, II, III, OR IV. ALTERNATIVE SEAL FINISH: SIGNODE OR DELTA PAINTED SEALS MAY BE USED AS AN ALTERNATIVE IF ALL SURFACES ARE PAINTED. GRITTED BACKING IS NOT PERMITTED.
STAPLE - - - - -	ASTM F1667; STFCs-189 OR STFCs-207, 15/16" OR 1" CROWN WIDTH X 3/4" LEG LENGTH FOR 3/4" STRAPPING, OR STFCs-224, 1-17/32" CROWN WIDTH X 3/4" LEG LENGTH FOR 1-1/4" STRAPPING.
HARDBOARD - - - - -	ANSI/AHA A135.4, CLASS 1.
FIBERBOARD - - - - -	ASTM D4727.
HONEYCOMB FILLER - - - - -	FIBERBOARD, FACING PAPER WEIGHT 69 POUNDS/1,000 SQUARE FEET, CORE PAPER WEIGHT 33 POUNDS/1,000 SQUARE FEET, 1/2" CORE CELL CENTERS, INTERNATIONAL HONEYCOMB CORP. (OR EQUAL).
FOAM CUSHIONING MATERIAL - - - - -	COMMERCIAL ITEM DESCRIPTION A-A-59136, CLASS 1, TYPE III, GRADE A, OR COMMERCIAL EQUIVALENT.

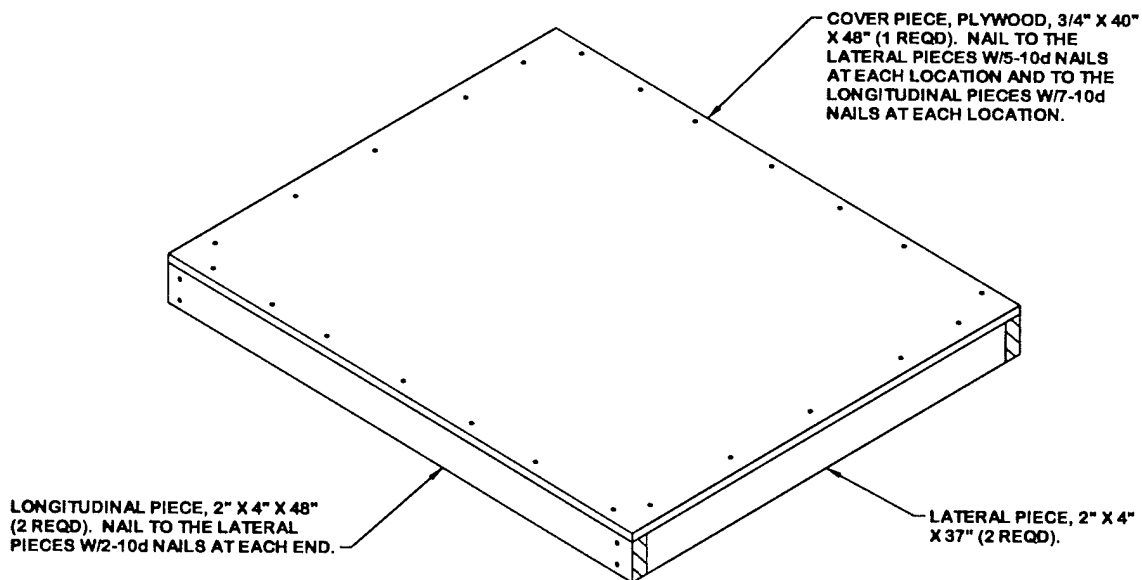


#### **PALLET UNIT A**

SEE GENERAL NOTE "N" ON PAGE 2.

RETROGRADE AMMUNITION INSIDE BOX	-----	2,684 LBS (APPROX)
DUNNAGE	-----	236 LBS
PALLET	-----	80 LBS
<hr/>		
TOTAL WEIGHT	-----	3,000 LBS (APPROX)
CUBE	-----	48.9 CU FT (APPROX)

BILL OF MATERIAL (PALLET UNIT "A")		
LUMBER	LINEAR FEET	BOARD FEET
2" X 4"	57.16	38.11
NAILS	NO. REQD	POUNDS
6d (2")	117	0.69
10d (3")	64	0.99
<hr/>		
PALLET, 40" X 48"	----- 1 REQD	80 LBS
STEEL STRAPPING, 1-1/4"	90.17' REQD	13.66 LBS
SEAL FOR 1-1/4" STRAPPING	6 REQD	0.27 LB
PLYWOOD, 3/4"	69.58 SQ FT REQD	143.51 LBS
STAPLE, 1-17/32" X 3/4"	24 REQD	NIL



#### **COVER/BASE ASSEMBLY**

(2 REQD)

#### **REVISIONS**

REVISION NO. 1, DATED JUNE 1991, CONSISTS OF:

ADDING PALLET UNIT "B" (CURRENT PALLET UNIT "A").

REVISION NO. 2, DATED OCTOBER 1993, CONSISTS OF:

1. ADDING WARNING NOTE TO PAGE 1.
2. REVISING THE MATERIAL SPECIFICATIONS.
3. REVISING GENERAL NOTE "H" ON PAGE 2 (CURRENT GENERAL NOTE "L").

REVISION NO. 3, DATED JUNE 1996, CONSISTS OF:

1. DELETING PALLET UNIT "A".
2. RENAMING PALLET UNIT "B" TO PALLET UNIT "A".
3. ADDING GENERAL NOTE PERMITTING CONTINUED USE OF EXISTING PALLET UNITS "A" IN STOCK.
4. CHANGING 2" X 8" PIECE IN BASE ASSEMBLY TO 2" X 4".
5. ADDING CLIP-LOK™ PALLET BOX (PALLET UNIT "B").
6. CHANGING ADDRESS IN WARNING.

REVISION NO. 4, DATED MAY 2003, CONSISTS OF:

1. UPDATING CONTACT INFORMATION IN WARNING ON PAGE 1 AND IN SPECIAL NOTE 2 ON PAGE 6.
2. ADDING GENERAL NOTES RELATING TO COOLER NAILS AND HEAT TREATMENT.
3. UPDATING MATERIAL SPECIFICATIONS.
4. DELETING GENERAL NOTE PERMITTING CONTINUED USE OF OLD PALLET UNITS "A" IN STOCK.

STRAPPING BOARD, 2"  
X 4" X 29" (2 REQD).

NOTCH ALL FOUR  
CORNERS AS  
SHOWN ABOVE.

1-1/2"  
3-1/2"  
6-3/4"

SIDE PANEL, PLYWOOD, 3/4" X 48"  
X 37" (1 REQD). NAIL TO THE  
STRAPPING BOARDS W/8-d NAILS  
AT EACH LOCATION.

6-3/4"

3-3/4"

**SIDE ASSEMBLY**  
(2 REQD)

END PANEL, PLYWOOD, 3/4" X 35-1/2" X  
37" (1 REQD). NAIL TO THE STRAPPING  
BOARDS AND CORNER PIECES W/7-6d  
NAILS AT EACH LOCATION.

CORNER PIECE, 2" X  
4" X 29" (2 REQD).

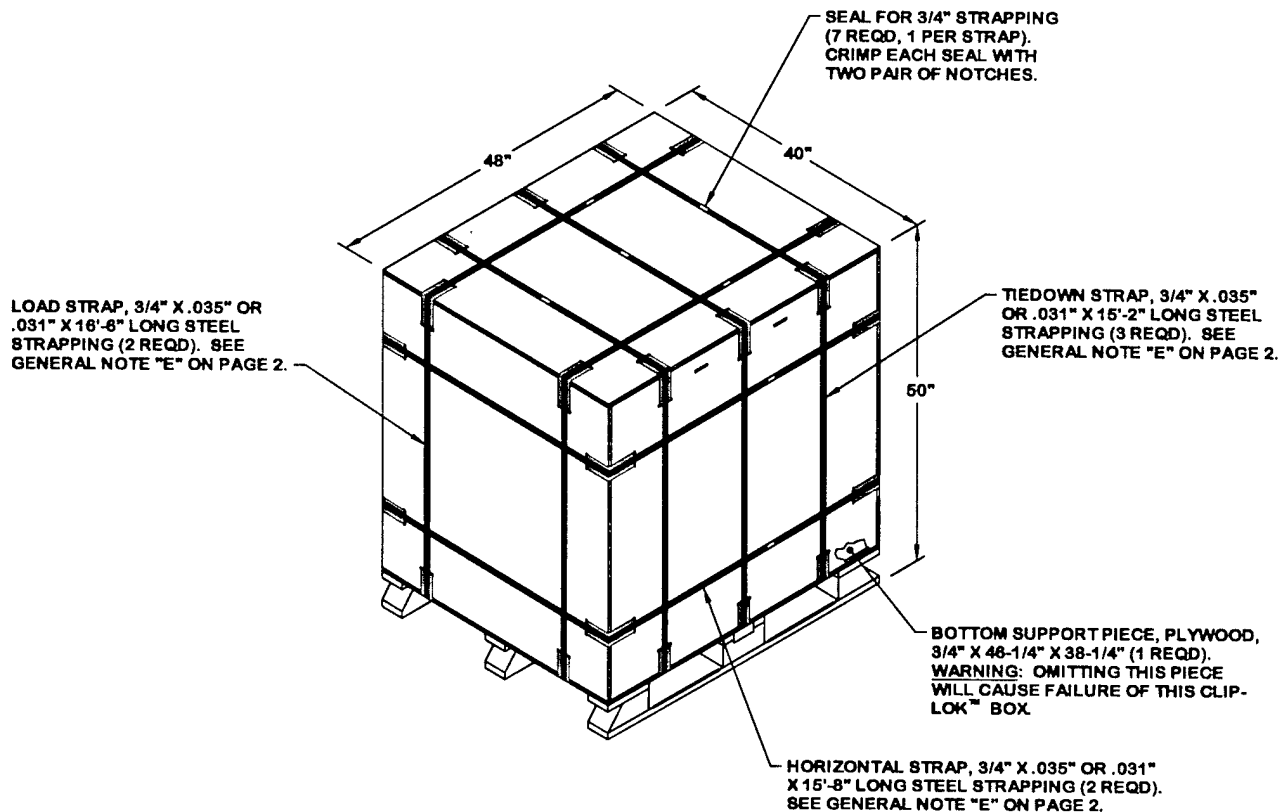
3-1/2" MIN

3-1/2" MIN

STRAPPING BOARD, 2" X  
4" X 28-1/2" (2 REQD).

**END ASSEMBLY**  
(2 REQD)





### **PALLET UNIT B**

SEE GENERAL NOTE "N" ON PAGE 2.

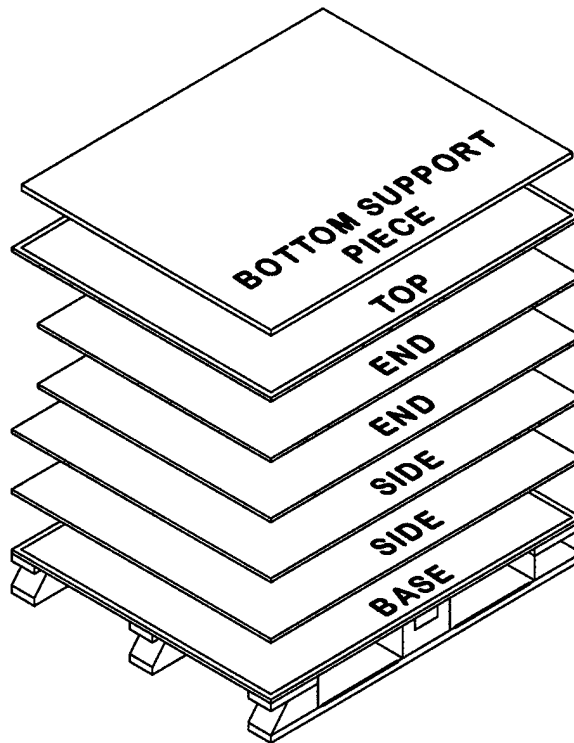
RETROGRADE AMMUNITION INSIDE BOX	- - - - -	3,754 LBS (APPROX)
DUNNAGE	- - - - -	10 LBS
PALLET BOX	- - - - -	236 LBS
<hr/>		
TOTAL WEIGHT	- - - - -	4,000 LBS (APPROX)
CUBE	- - - - -	55.6 CU FT (APPROX)

### **BILL OF MATERIAL (PALLET UNIT "B")**

PALLET BOX, CLIP-LOK™	- - - - -	1 REQD	- - -	236 LBS
STEEL STRAPPING, 3/4"	- - -	109.83'	REQD	- - - 9.81 LBS
SEAL FOR 3/4" STRAPPING	- - -	7 REQD	- - -	NIL

### **SPECIAL NOTES:**

1. SOURCE OF SUPPLY: THE CLIP-LOK™ REFERENCE NUMBER RIA998 HAS BEEN TESTED UNDER MIL-STD-1680 AND APPROVED FOR USE. THIS PALLET BOX CAN BE OBTAINED FROM CLIP-LOK SIMPAK™ USA, INC., 1-800-448-CLIP.
2. OTHER VENDERS' PALLET BOXES MAY BE QUALIFIED FOR USE BY SUBMITTING SAMPLE BOXES TO THE DEFENSE AMMUNITION CENTER, 1 C TREE ROAD, MCALESTER, OK 74501-9053. CONTACT THE TACOM-ARDEC PACKAGING OFFICE, AMSTA-AR-WEP-RP, TELEPHONE 309-782-8205, E-MAIL WEP-R@RIA.ARMY.MIL, OR THE DAC TRANSPORTATION ENGINEERING DIVISION, SJMAC-DET, TELEPHONE 918-420-8927, E-MAIL SJMAC-DET@DAC.ARMY.MIL.



**STACKING FOR COLLAPSED CLIP-LOK™ BOX**

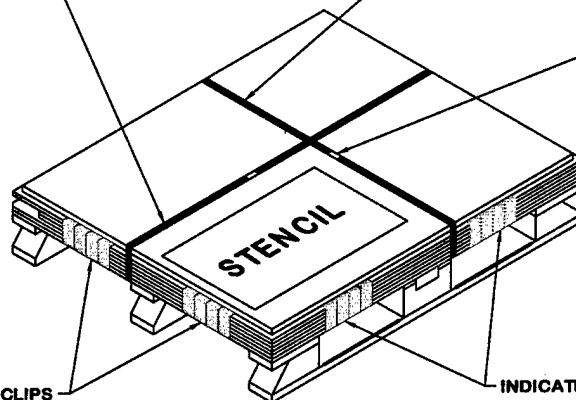
BUNDLING LOAD STRAP, 3/4"  
X .035" OR .031" X 9'-8" LONG STEEL  
STRAPPING (1 REQD).

BUNDLING TIEDOWN STRAP, 3/4"  
X .035" OR .031" X 8'-6" LONG STEEL  
STRAPPING (1 REQD).

SEAL FOR 3/4" STRAPPING  
(2 REQD, 1 PER STRAP).

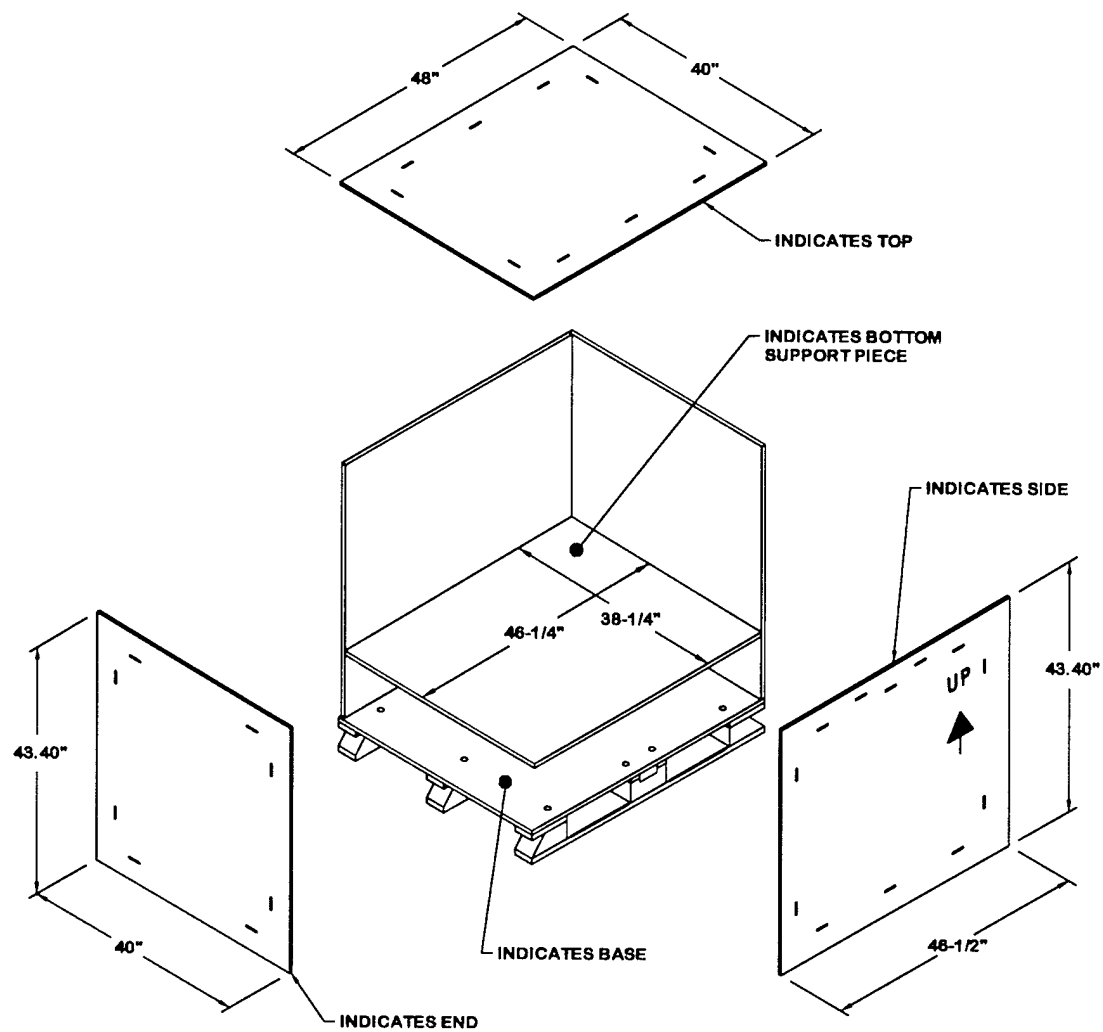
INDICATES CLIPS

INDICATES CLIPS



**COLLAPSED BOX**

SEE THE STENCIL DETAIL ON PAGE 8.



**STENCIL (FOR APPLICATION TO BOTTOM SUPPORT PIECE)**

**SPECIAL NOTES:**

1. THE DETAIL DEPICTED ABOVE WILL BE STENCILED ON THE BOTTOM SUPPORT PIECE TO SHOW ASSEMBLY INSTRUCTIONS. SEE THE "COLLAPSED BOX" DETAIL ON PAGE 7.
2. AN ARROW WITH UP WILL BE STENCILED ON THE SIDE PIECES AS SHOWN TO ENSURE THE STACKING SLOTS ARE ON TOP.

# UNITIZATION PROCEDURES FOR PALLET BOX PACKING OF 20MM, 25MM OR 30MM CARTRIDGES

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APPROVED, U.S. ARMY JOINT MUNITIONS COMMAND <i>NLT</i>  <i>Mark J. Belmont</i> AMSTA-AR-WEP-RP  <i>James M. [Signature]</i> AMSTA-AR-WEP-RP  APPROVED BY ORDER OF COMMANDING GENERAL, U.S. ARMY MATERIEL COMMAND  <i>Charles P. [Signature]</i> U.S. ARMY DEFENSE AMMUNITION CENTER		<b>CAUTION: VERIFY PRIOR TO USE AT WWW.DAC.ARMY.MIL/DET THAT THIS IS THE MOST CURRENT VERSION OF THIS DOCUMENT. THIS IS PAGE 1 OF 10.</b>	
<b>DO NOT SCALE</b>		<b>JUNE 1991</b>	
ENGINEER OR TECHNICIAN	BASIC REV.	SANDRA M. SCHULTZ  MELVIN D. SIX	
TRANSPORTATION ENGINEERING DIVISION		SEE THE REVISION LISTING ON PAGE 4	
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ENGINEERING DIRECTORATE		DRAWING	FILE
19		48	4233/7 20PE1000

PROJECT CA 245/7-87

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- G. IN ORDER TO OBTAIN COMPACT AND SOUND UNITS, ALL STRAPS SHALL BE LOCATED IN PROPER ALIGNMENT AND TENSIONED UNTIL THEY CUT INTO THE EDGE OF THE PALLET BOX AND THE PALLET DECK. AFTER TENSIONING, ALL STRAPS WILL BE SECURED USING ONE SEAL AND TWO PAIR OF NOTCHES PER SEAL.
- H. COOLER NAILS MAY BE SUBSTITUTED FOR THE COMMON NAILS AS SPECIFIED BY APPLYING THE FOLLOWING GUIDANCE. THE NUMBER OF COOLER NAILS TO BE USED WILL BE THE NUMBER OF COMMON NAILS MULTIPLIED BY 1.2 AND ROUNDED UP TO THE NEXT WHOLE NUMBER. THE SIZE OF THE COOLER NAILS TO BE USED WILL BE THE SAME AS SPECIFIED FOR THE COMMON NAILS (4d, 6d, 10d, ETC.) BUT WILL CONFORM TO THE SIZE AND WEIGHT TOLERANCES SPECIFIED WITHIN ASTM F1667 FOR COOLER NAILS.
- J. ALL NON-MANUFACTURED WOOD USED IN THE PALLETIZED LOAD SHALL BE HEAT TREATED TO A CORE TEMPERATURE OF 56 DEGREES CELSIUS FOR A MINIMUM OF 30 MINUTES. THE PALLET MANUFACTURER AND THE MANUFACTURER OF WOOD TO BUILD FILLER ASSEMBLIES AND DUNNAGE ASSEMBLIES FOR THE PALLETIZED LOAD SHALL BE AFFILIATED WITH AN INSPECTION AGENCY ACCREDITED BY THE AMERICAN LUMBER STANDARDS COMMITTEE. THE PALLET MANUFACTURER AND THE MANUFACTURER OF WOOD USED TO BUILD FILLER ASSEMBLIES AND DUNNAGE ASSEMBLIES FOR THE PALLETIZED LOAD SHALL ENSURE TRACEABILITY TO THE ORIGINAL SOURCE OF HEAT TREATMENT. EACH PALLET, FILLER ASSEMBLY, OR DUNNAGE ASSEMBLY SHALL BE MARKED TO SHOW THE CONFORMANCE TO THE INTERNATIONAL PLANT PROTECTION CONVENTION STANDARD. PALLETS, FILLER ASSEMBLIES AND DUNNAGE ASSEMBLIES MADE OF NON-MANUFACTURED WOOD SHALL BE HEAT TREATED AND MARKED APPROPRIATELY. THE QUALITY MARK FOR THE PALLET SHALL BE PLACED ON TWO OPPOSITE END POSTS ON THE SAME SIDE AS THE PRESERVATIVE MARKING. THE QUALITY MARK FOR THE FILLER ASSEMBLIES AND DUNNAGE ASSEMBLIES SHALL BE PLACED ON TWO OPPOSITE SIDES. FOREIGN MANUFACTURERS SHALL HAVE THE HEAT TREATMENT OF NON-MANUFACTURED WOOD PRODUCTS VERIFIED IN ACCORDANCE WITH THEIR NATIONAL PLANT PROTECTION ORGANIZATION'S COMPLIANCE PROGRAM. CLIP-LOK™ BOXES, AS DEPICTED ON PAGE 7, ARE CONSTRUCTED OF ALL PLYWOOD AND DO NOT REQUIRE HEAT TREATMENT.
- K. UNIT LOAD MARKING MUST BE APPLIED AND MUST BE REQUESTED FROM THE ORGANIZATION LISTED IN THE "WARNING" ON THE COVER PAGE.

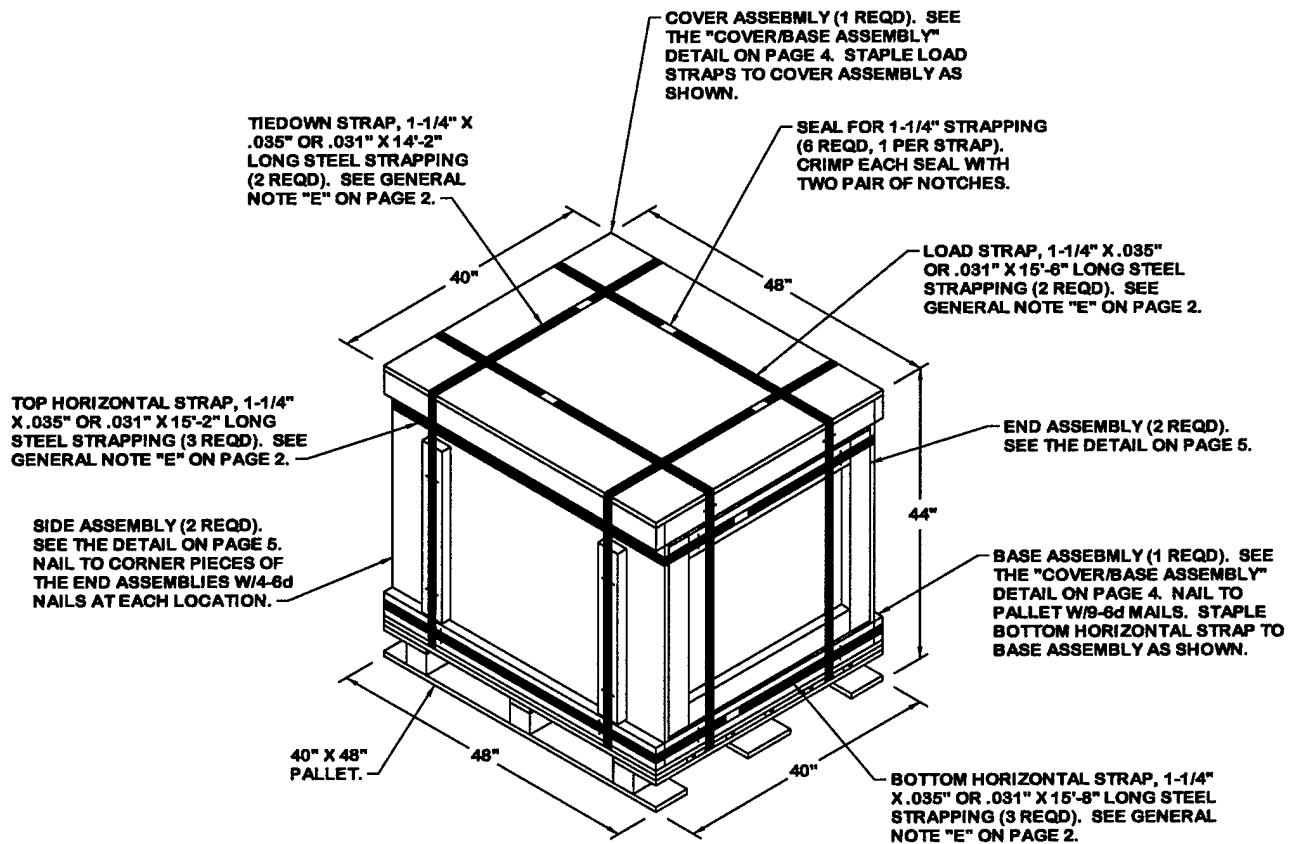
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## (GENERAL NOTES CONTINUED)

- L. PACKAGED RETROGRADE AMMUNITION MUST CONTACT THE SIDE AND END ASSEMBLIES. FIBERBOARD LINERS SHALL BE USED FOR UNPACKAGED RETROGRADE AMMUNITION TO PREVENT CONTACT WITH THE SIDE AND END ASSEMBLIES. FILLERS SUCH AS PLYWOOD, FIBERBOARD, HONEYCOMB FILLER, FOAM CUSHIONING MATERIAL OR HARDBOARD SHALL BE ADDED AS REQUIRED TO OBTAIN A TIGHT PACK.
- M. PALLET UNIT "A" DETAILS ARE BASED ON THE MAXIMUM ALLOWABLE DIMENSIONS OF THE PALLET UNIT. THE HEIGHT OF THE SIDE AND END ASSEMBLIES MAY BE SHORTENED ACCORDING TO THE SIZE AND WEIGHT OF THE RETROGRADE AMMUNITION ITEMS INSIDE.
- N. REGARDLESS OF THE QUANTITY OF RETROGRADE AMMUNITION ITEMS TO BE PALLETIZED, THE TOTAL WEIGHT OF A FULLY LOADED PALLET UNIT WILL NOT EXCEED 3,000 POUNDS FOR PALLET UNIT "A" AND 4,000 POUNDS FOR PALLET UNIT "B". WHEN THE TOTAL WEIGHT OF A FULLY LOADED PALLET UNIT EXCEEDS THESE WEIGHTS, AMMUNITION ITEMS MUST BE REMOVED, AND FILLER MATERIAL, SUCH AS EMPTY BOXES, FIBERBOARD, HARDBOARD, HONEYCOMB FILLER, FOAM CUSHIONING MATERIAL, PLYWOOD, OR WOOD MUST BE SUBSTITUTED.
- O. THE STYLE 1 PALLET DELINEATED IN THE DETAIL ON PAGE 3 NEED NOT HAVE CHAMFERS AS SPECIFIED WITHIN MILITARY SPECIFICATION MIL-P-15011 WHEN USED FOR THE UNITIZATION OF ITEMS COVERED BY THIS APPENDIX.

## MATERIAL SPECIFICATIONS

PALLET - - - - -	MIL SPEC MIL-P-15011; 4-WAY ENTRY, STYLE 1, TYPE I, CLASS 1, HEAT TREATED. SEE GENERAL NOTE "J".
LUMBER - - - - -	SEE TM 743-200-1 (DUNNAGE LUMBER) AND VOLUNTARY PRODUCT STANDARD PS 20. HEAT TREATMENT REQUIRED. SEE GENERAL NOTE "J".
NAILS - - - - -	ASTM F1667; COMMON STEEL NAIL (NLCMS OR NLCMS). ALT: UNDERLAYMENT NAIL (NLUL), PALLET NAIL (NLPL), OR COOLER NAIL (NLCL) OF SAME SIZE. SEE GENERAL NOTE "H".
PLYWOOD - - - - -	COMMERCIAL ITEM DESCRIPTION A-A-55057, INDUSTRIAL PLYWOOD, INTERIOR WITH EXTERIOR GLUE, GRADE C-D. IF SPECIFIED GRADE IS NOT AVAILABLE, A BETTER INTERIOR OR AN EXTERIOR GRADE MAY BE SUBSTITUTED.
STRAPPING, STEEL - - - - -	ASTM D3953; FLAT STRAPPING, TYPE 1, HEAVY DUTY, FINISH B (GRADE 2), SIZE 3/4" OR 1-1/4" X .035" OR .031", NOTE: BRITTE OR SLIT EDGES SHALL HAVE FINISH A OVERLAY.
SEAL, STEEL - - - - -	ASTM D3953; CLASS H, FINISH B (GRADE 2), DOUBLE NOTCH TYPE, STYLE I, II, III, OR IV. ALTERNATIVE SEAL FINISH: SIGNODE OR DELTA PAINTED SEALS MAY BE USED AS AN ALTERNATIVE IF ALL SURFACES ARE PAINTED. GRITTED BACKING IS NOT PERMITTED.
STAPLE - - - - -	ASTM F1667; STFC-189 OR STFC-207, 15/16" OR 1" CROWN WIDTH X 3/4" LEG LENGTH FOR 3/4" STRAPPING, OR STFC-224, 1-17/32" CROWN WIDTH X 3/4" LEG LENGTH FOR 1-1/4" STRAPPING.
HARDBOARD - - - - -	ANSI/AHA A135.4, CLASS 1.
FIBERBOARD - - - - -	ASTM D4727.
HONEYCOMB FILLER - - - - -	FIBERBOARD, FACING PAPER WEIGHT 69 POUNDS/1,000 SQUARE FEET, CORE PAPER WEIGHT 33 POUNDS/1,000 SQUARE FEET, 1/2" CORE CELL CENTERS, INTERNATIONAL HONEYCOMB CORP. (OR EQUAL).
FOAM CUSHIONING MATERIAL - - - - -	COMMERCIAL ITEM DESCRIPTION A-A-59136, CLASS 1, TYPE III, GRADE A, OR COMMERCIAL EQUIVALENT.



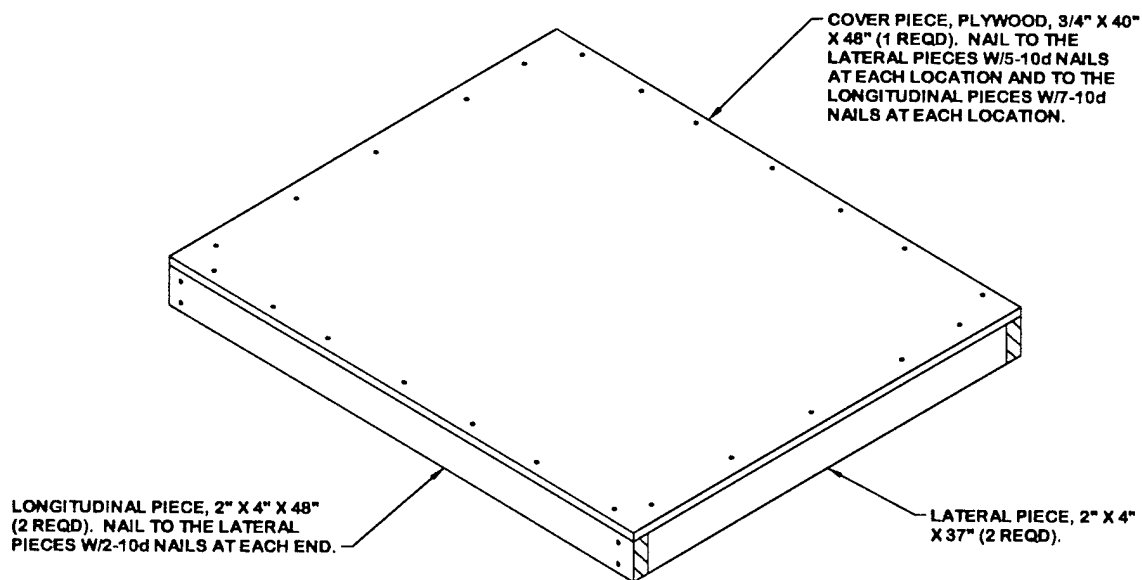
#### PALLET UNIT A

SEE GENERAL NOTE "N" ON PAGE 2.

RETROGRADE 20MM, 25MM, OR 30MM CARTRIDGES - - - 2,641 LBS (MAXIMUM)  
DUNNAGE - - - - - 279 LBS (MINIMUM)  
PALLET - - - - - 80 LBS

TOTAL WEIGHT - - - - - 3,000 LBS (MAXIMUM)  
CUBE - - - - - 48.9 CU FT (APPROX)

BILL OF MATERIAL (PALLET UNIT "A")		
LUMBER	LINEAR FEET	BOARD FEET
2" X 4"	57.16	38.11
NAILS	NO. REQD	POUNDS
6d (2")	117	0.69
10d (3")	64	0.98
PALLET, 40" X 48"	1 REQD	80 LBS
PLYWOOD, 1/2"	25.88 SQ FT REQD	35.58 LBS
PLYWOOD, 3/4"	69.58 SQ FT REQD	143.50 LBS
FIBERBOARD, 1/8"	AS NEEDED	VARIES
FIBERBOARD, 1/4"	51.75 SQ FT REQD	2.16 LBS
FIBERBOARD, 1/2"	21.33 SQ FT REQD	1.78 LBS
FIBERBOARD, 1"	28.19 SQ FT REQD	4.70 LBS
STEEL STRAPPING, 1-1/4"	90.17' REQD	12.88 LBS
SEAL FOR 1-1/4" STRAPPING	6 REQD	0.27 LB
STAPLE, 1-17/32" X 3/4"	24 REQD	0.25 LB



#### **COVER/BASE ASSEMBLY**

(2 REQD)

#### **REVISIONS**

REVISION NO. 1, DATED JUNE 1996, CONSISTS OF:

1. CHANGING THE PALLET BOX ON PAGE 2 TO CONFORM TO DRAWING 19-48-4233.
2. CHANGING THE INTERNAL DUNNAGE TO CONFORM TO THE PALLET BOX ON PAGE 2.
3. ADDING CLIP-LOK™ PALLET BOX.
4. ADDING WARNING.

REVISION NO. 2, DATED MAY 2003, CONSISTS OF:

1. UPDATING CONTACT INFORMATION IN WARNING ON PAGE 1 AND IN SPECIAL NOTE 2 ON PAGE 7.
2. ADDING GENERAL NOTES RELATING TO COOLER NAILS AND HEAT TREATMENT.
3. UPDAING MATERIAL SPECIFICATIONS.
4. DELETING GENERAL NOTE PERMITTING CONTINUED USE OF OLD PALLET UNITS "A" IN STOCK.

STRAPPING BOARD, 2" X 4" X 29" (2 REQD).

NOTCH ALL FOUR CORNERS AS SHOWN ABOVE.

1-1/2"  
3-1/2"  
6-3/4"

SIDE PANEL, PLYWOOD, 3/4" X 48" X 37" (1 REQD). NAIL TO THE STRAPPING BOARDS W/8d NAILS AT EACH LOCATION.

6-3/4"

**SIDE ASSEMBLY**  
(2 REQD)

3-3/4"

END PANEL, PLYWOOD, 3/4" X 35-1/2" X 37" (1 REQD). NAIL TO THE STRAPPING BOARDS AND CORNER PIECES W/7-6d NAILS AT EACH LOCATION.

CORNER PIECE, 2" X 4" X 29" (2 REQD).

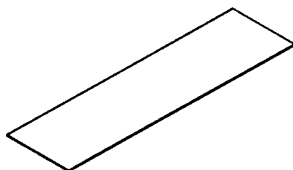
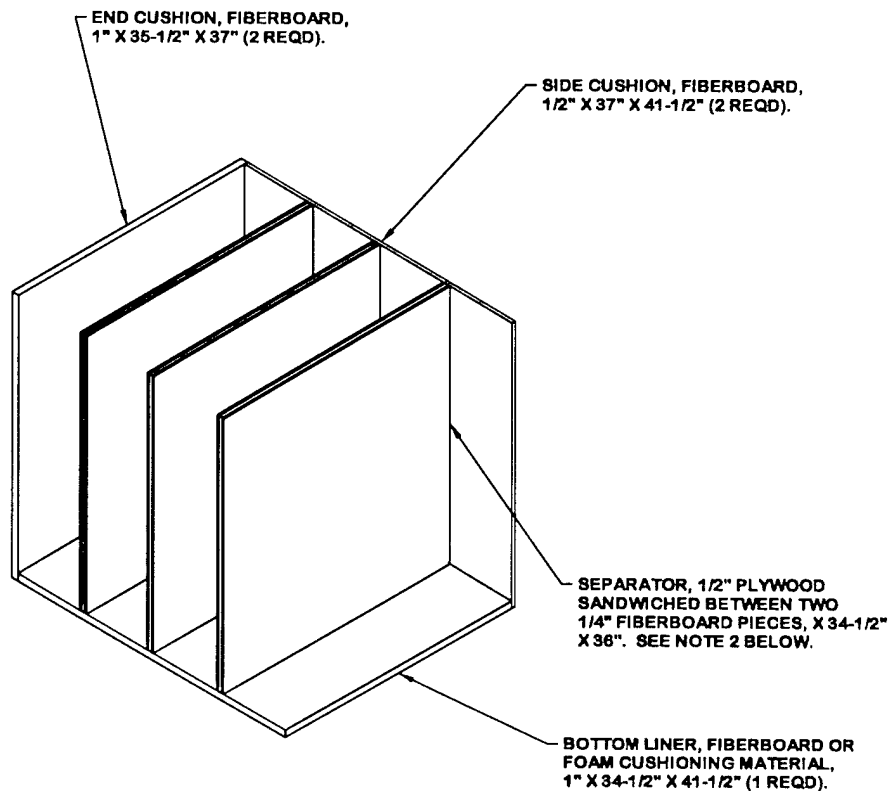
3-1/2" MIN

STRAPPING BOARD, 2" X 4" X 28-1/2" (2 REQD).

3-1/2" MIN

**END ASSEMBLY**  
(2 REQD)



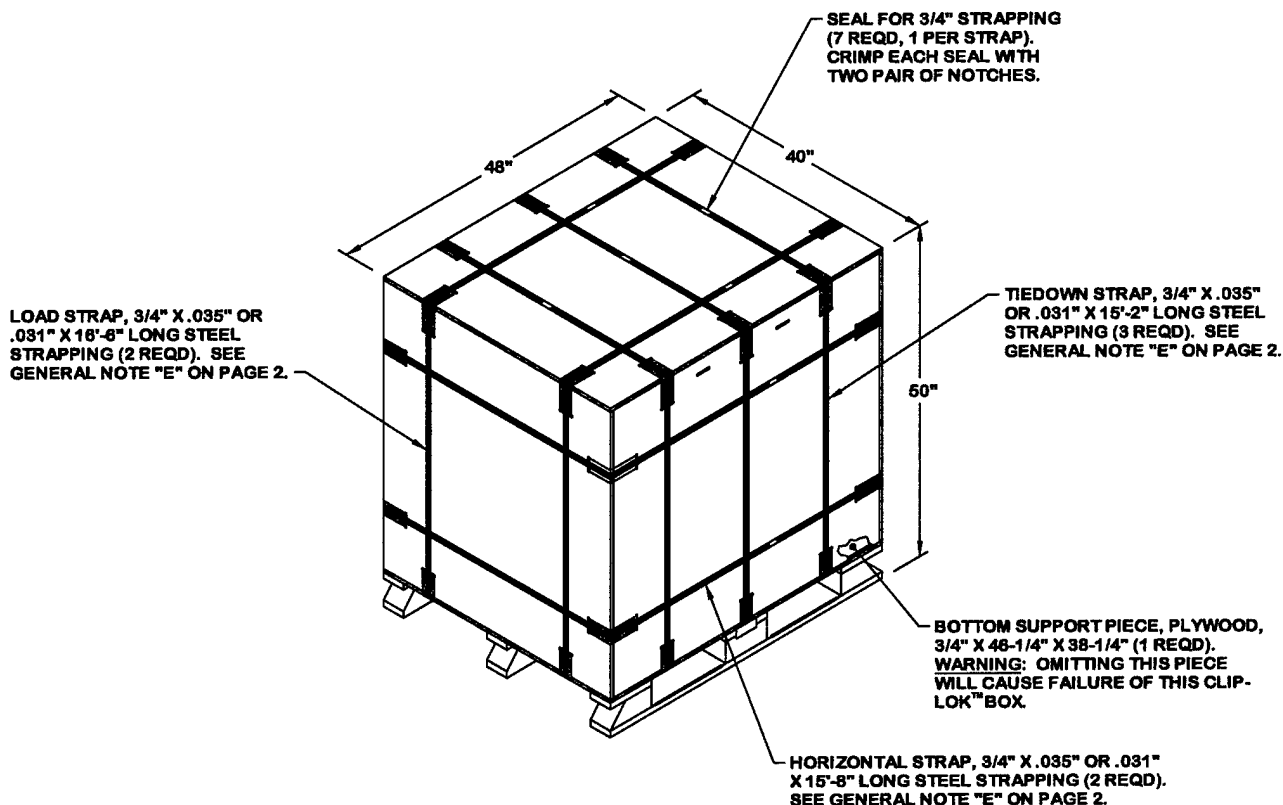


#### **HORIZONTAL SPACER**

FIBERBOARD, 1/8" X 34-1/2" X 8-7/8" (MAX) (1 REQD PER EACH ROW, PER EACH SECTION). NOT INCLUDED IN BILL OF MATERIAL WEIGHTS.

#### **PACKING INSTRUCTIONS:**

1. DUE TO VARIATIONS IN LENGTH (6.5" TO 8.8"), DIAMETER, WEIGHT (0.5 TO 1.1 LBS) AND CONFIGURATION (LINKED OR UNLINKED), THE NUMBER OF ROUNDS PER INDIVIDUAL PARTITION CELL AND THE TOTAL FOR THE BOX WILL VARY. TOTAL WEIGHT OF THE RETROGRADE BOX MUST NOT EXCEED 3,000 LBS.
2. DEPENDING ON THE LENGTH OF CARTRIDGES, EITHER FOUR ROWS OF 34-1/2" LONG SEPARATORS FOR 7-1/2" WIDE SECTIONS OR THREE ROWS OF 34-1/2" LONG SEPARATORS FOR 9-5/8" WIDE SECTIONS OR THREE ROWS OF 41-1/2" LONG SEPARATORS RUNNING LENGTHWISE (ROTATED 90° FROM THE SEPARATORS DEPICTED ABOVE), FOR 7-7/8" WIDE SECTIONS MAY BE USED. CARTRIDGES WILL BE PLACED EITHER NOSE-TO-NOSE OR BASE-TO-BASE IN ADJACENT ROWS.
3. PLACE ONE ROW OF CARTRIDGES WITHIN THE BOX SECTION. FILL ANY VOIDS WITH FIBERBOARD CUT TO FIT TO PROVIDE A TIGHT FIT. POSITION HORIZONTAL SPACER AND REPEAT PROCESS, NOTE THAT THE HORIZONTAL SPACER MAY REQUIRE TRIMMING TO PERMIT LOOPING OF LINKED AMMUNITION TO THE NEXT LAYER.
4. CONTINUE TO FILL ALL SECTIONS UNTIL BOX IS FULL OR MAXIMUM WEIGHT OF 3,000 POUNDS IS REACHED. IF THE BOX CANNOT BE FILLED DUE TO REACHING WEIGHT LIMIT, THE INDIVIDUAL SECTIONS SHOULD BE FILLED TO APPROXIMATELY THE SAME LEVEL TO MAINTAIN THE BOX'S CENTER OF GRAVITY.
5. ANY VOIDS BETWEEN THE TOP ROW OF CARTRIDGES AND THE TOP OF THE BOX WILL BE FILLED WITH FIBERBOARD AS REQUIRED TO PROVIDE CONTACT WITH THE COVER WHEN INSTALLED.



#### **PALLET UNIT B**

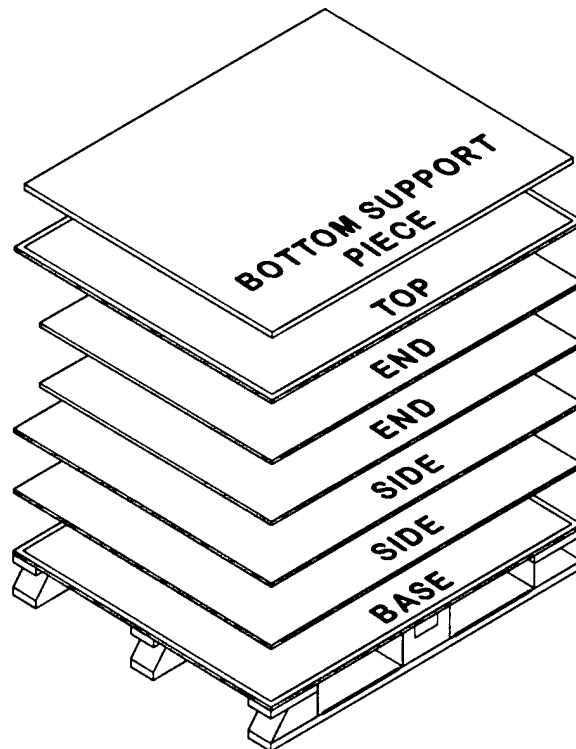
SEE GENERAL NOTE "N" ON PAGE 2.

RETROGRADE 20MM, 25MM OR 30MM CARTRIDGES -	3,677 LBS (MAXIMUM)
DUNNAGE -	63 LBS (MINIMUM)
PALLET -	260 LBS
<hr/>	
TOTAL WEIGHT -	4,000 LBS (MAXIMUM)
CUBE -	55.6 CU FT (APPROX)

BILL OF MATERIAL (PALLET UNIT "B")			
PALLET BOX, CLIP-LOK™	- - - - 1 REQD	- - -	260 LBS
PLYWOOD, 1/2"	- - - 33.29 SQ FT REQD	- - -	45.77 LBS
FIBERBOARD, 1/8"	- - - - AS NEEDED	- - -	VARIES
FIBERBOARD, 1/4"	- - 33.29 SQ FT REQD	- - -	1.39 LBS
FIBERBOARD, 1/2"	- - 26.11 SQ FT REQD	- - -	2.18 LBS
FIBERBOARD, 1"	- - 32.53 SQ FT REQD	- - -	5.43 LBS
STEEL STRAPPING, 3/4"	- 110.25' REQD	- - -	9.84 LBS
SEAL FOR 3/4" STRAPPING	- - - 7 REQD	- - -	NIL
STAPLE, 1-17/32" X 3/4"	- - - 24 REQD	- - -	NIL

#### **SPECIAL NOTES:**

1. SOURCE OF SUPPLY: THE CLIP-LOK™ REFERENCE NUMBER RIA996I HAS BEEN TESTED UNDER MIL-STD-1660 AND APPROVED FOR USE. THIS PALLET BOX CAN BE OBTAINED FROM CLIP-LOK SIMPAK™ USA, INC., 1-800-448-CLIP.
2. OTHER VENDERS' PALLET BOXES MAY BE QUALIFIED FOR USE BY SUBMITTING SAMPLE BOXES TO THE DEFENSE AMMUNITION CENTER, 1 C TREE ROAD, MCALESTER, OK 74501-9053. CONTACT THE TACOM-ARDEC PACKAGING OFFICE, AMSTA-AR-WEP-RP, TELEPHONE 309-782-8205, E-MAIL WEP-R@RIA.ARMY.MIL, OR THE DAC TRANSPORTATION ENGINEERING DIVISION, SJMAC-DET, TELEPHONE 918-420-8927, E-MAIL SJMAC-DET@DAC.ARMY.MIL.

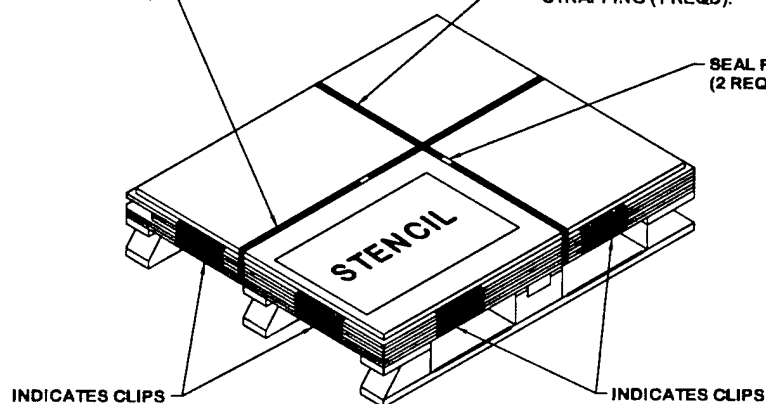


**STACKING FOR COLLAPSED CLIP-LOK™ BOX**

BUNDLING LOAD STRAP, 3/4"  
X .035" OR .031" X 9'-9" LONG STEEL  
STRAPPING (1 REQD).

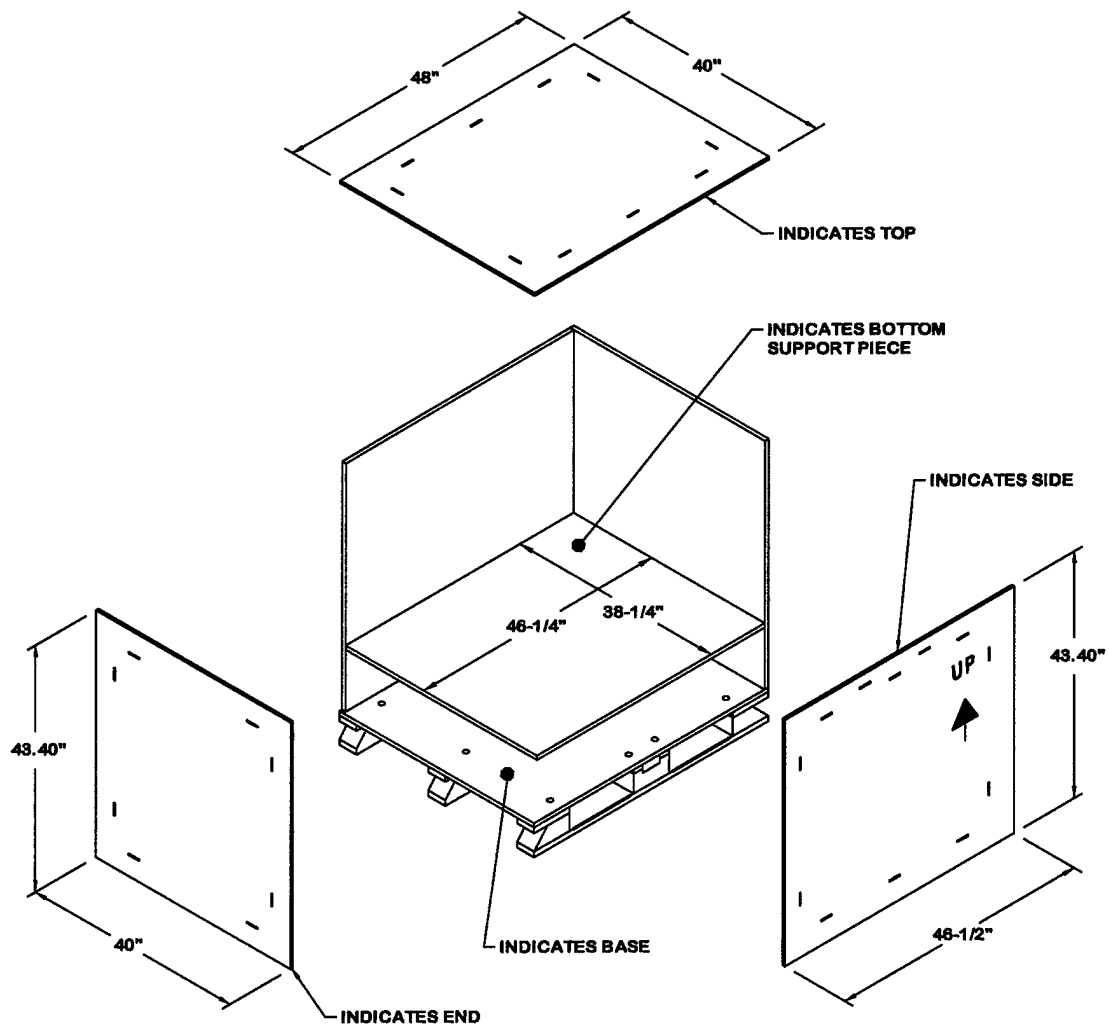
BUNDLING TIEDOWN STRAP, 3/4"  
X .035" OR .031" X 8'-6" LONG STEEL  
STRAPPING (1 REQD).

SEAL FOR 3/4" STRAPPING  
(2 REQD, 1 PER STRAP).



**COLLAPSED BOX**

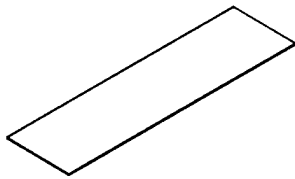
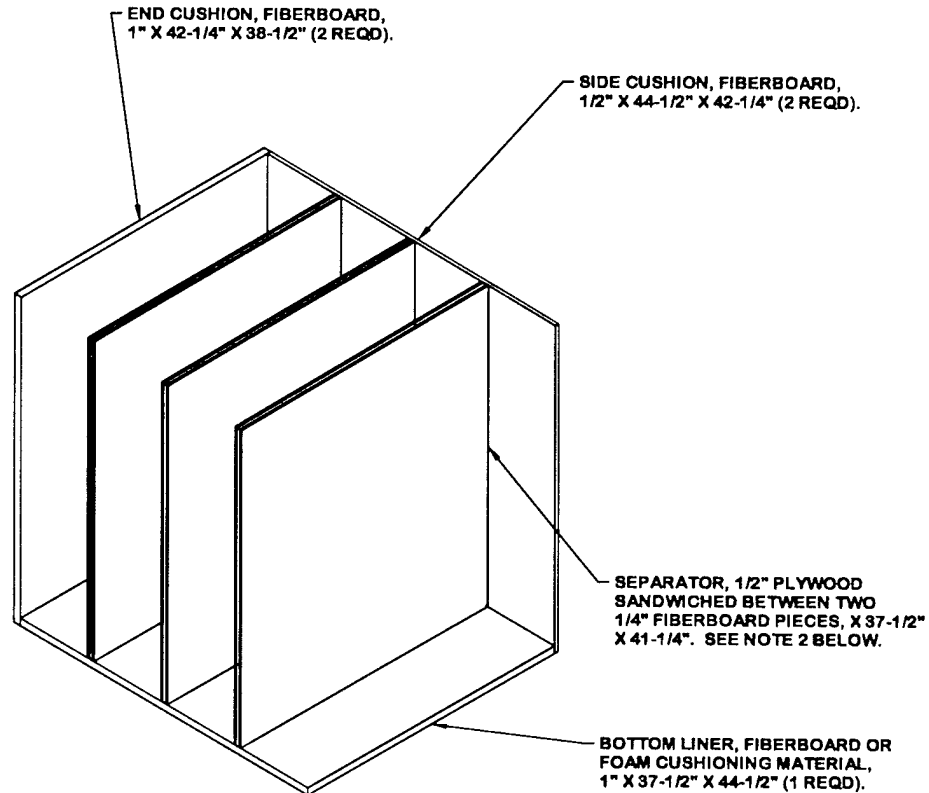
SEE THE STENCIL DETAIL ON PAGE 9.



**STENCIL (FOR APPLICATION TO BOTTOM SUPPORT PIECE)**

**SPECIAL NOTES:**

1. THE DETAIL DEPICTED ABOVE WILL BE STENCILED ON THE BOTTOM SUPPORT PIECE TO SHOW ASSEMBLY INSTRUCTIONS. SEE THE "COLLAPSED BOX" DETAIL ON PAGE 8.
2. AN ARROW WITH UP WILL BE STENCILED ON THE SIDE PIECES AS SHOWN TO ENSURE THE STACKING SLOTS ARE ON TOP.



#### HORIZONTAL SPACER

FIBERBOARD, 1/8" X 37-1/2" X 8-7/8" (MAX) (1 REQD PER EACH ROW, PER EACH SECTION). NOT INCLUDED IN BILL OF MATERIAL WEIGHTS.

#### PACKING INSTRUCTIONS:

1. DUE TO VARIATIONS IN LENGTH (6.5" TO 8.8"), DIAMETER, WEIGHT (0.5 TO 1.1 LBS) AND CONFIGURATION (LINKED OR UNLINKED), THE NUMBER OF ROUNDS PER INDIVIDUAL PARTITION CELL AND THE TOTAL FOR THE BOX WILL VARY. TOTAL WEIGHT OF THE RETROGRADE BOX MUST NOT EXCEED 3,000 LBS.
2. DEPENDING ON THE LENGTH OF CARTRIDGES, EITHER FOUR ROWS OF 37-1/2" LONG SEPARATORS FOR 8-1/8" WIDE SECTIONS OR THREE ROWS OF 37-1/2" LONG SEPARATORS FOR 10-3/8" WIDE SECTIONS OR THREE ROWS OF 44-1/2" LONG SEPARATORS RUNNING LENGTHWISE (ROTATED 90° FROM THE SEPARATORS DEPICTED ABOVE), FOR 8-5/8" WIDE SECTIONS MAY BE USED. CARTRIDGES WILL BE PLACED EITHER NOSE-TO-NOSE OR BASE-TO-BASE IN ADJACENT ROWS.
3. PLACE ONE ROW OF CARTRIDGES WITHIN THE BOX SECTION. FILL ANY VOIDS WITH FIBERBOARD CUT TO FIT TO PROVIDE A TIGHT FIT. POSITION HORIZONTAL SPACER AND REPEAT PROCESS, NOTE THAT THE HORIZONTAL SPACER MAY REQUIRE TRIMMING TO PERMIT LOOPING OF LINKED AMMUNITION TO THE NEXT LAYER.
4. CONTINUE TO FILL ALL SECTIONS UNTIL BOX IS FULL OR MAXIMUM WEIGHT OF 3,000 POUNDS IS REACHED. IF THE BOX CANNOT BE FILLED DUE TO REACHING WEIGHT LIMIT, THE INDIVIDUAL SECTIONS SHOULD BE FILLED TO APPROXIMATELY THE SAME LEVEL TO MAINTAIN THE BOX'S CENTER OF GRAVITY.
5. ANY VOIDS BETWEEN THE TOP ROW OF CARTRIDGES AND THE TOP OF THE BOX WILL BE FILLED WITH FIBERBOARD AS REQUIRED TO PROVIDE CONTACT WITH THE COVER WHEN INSTALLED.